January 1983

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sinclair user

Issue No 10

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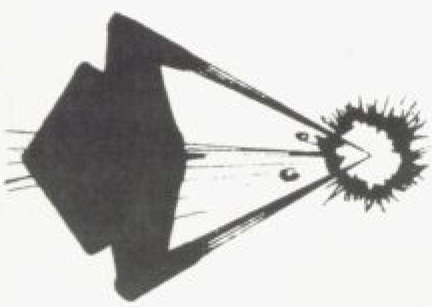
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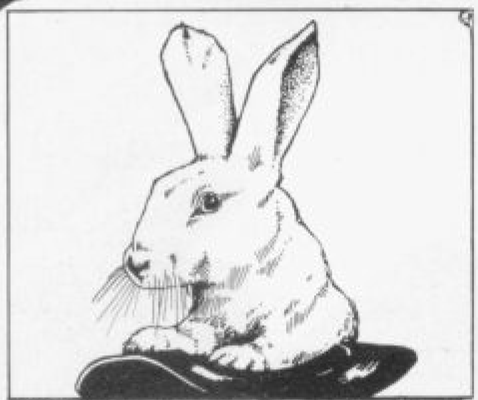
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NEXT MONTH

We look in-depth at the increasing amount of of arcade-quality games and continue our series on good programming.



More excitement guaranteed

THE NEW YEAR is the traditional time for starting afresh; a time for laying the old year to rest and greeting the next 12 months with all the enthusiasm which is saved only for the new and the unknown.

It is also the traditional time for prophets to attempt to clear the shadowy gloom and look into the future. On the Sinclair scene that is almost impossible. A quick glance at last year's development should be sufficient to show that one month's unexpected wonders are next month's accepted truths.

In a market where, as the Spectrum was launched funeral rites were being read over the ZX-81 and the hardware add-ons industry, only a few months later both were health and blossoming, anything can happen.

There are, however, a few areas which should be watched closely for important developments in the coming months. Top of the list are the long-expected peripherals for the Spectrum — the Microdrive, the RS232 and network interfaces and the Prestel adaptor. To prove they were more than a gleam in Clive Sinclair's eye, prototypes were on display at the Compec exhibition in London. Company confidence in its products appeared to be limited, however, and few people were able to look closely at what was being offered.

The most interesting item, of course, is the Microdrive, the insides of which have kept Sinclair watchers guessing ever since the small black box was displayed at the launch of the Spectrum last April. Despite it being promised before the end of 1982, the latest official estimate is that it will be on sale some time in the first three months of 1983.

Whatever form it takes, it will be needed sooner rather than later to keep Sincliar ahead of the pack.

A growing number of competitors will be another feature of the year, with the long-expected moves from the Japanese beginning to materialise. Sharp, Sanyo and Epson are a few of the names which have begun to appear, each making claims to be better than the Sinclair machines. As yet it is impossible to assess their impact, mainly because they seem to have adopted the tactics of many other parts of the home computer market of issuing a prospectus without the goods to back it up.

The Japanese appear to be no better than anyone else when it concerns the advance announcement of a product, which then takes months to materialise.

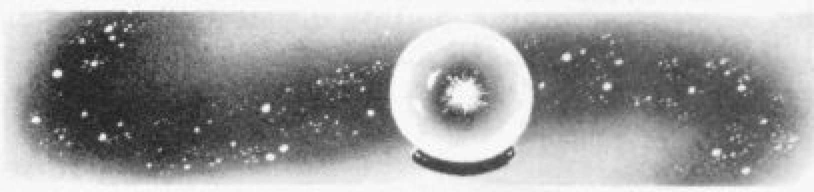
Whatever people may think about Sinclair delivery problems — and the latest report from the Advertising Standards Authority is a further guide to the number of people who have not been impressed by deliveries — both the Spectrum and the ZX-81 are available and living up to expectations once they arrive. Despite claims of being ready to go into production, most of the competitors would seem to be at the stage of Sinclair's projected move further up-market which as yet is still at the development stage.

The conclusion would seem to be that the main Sinclair competition is likely to be from the established machines — Dragon, Acorn and the Commodore Vic. The Japanese, when eventually they arrive, will probably dip in their toes at the top end of market. All of which leaves the ZX-81 in a class of its own.

Despite the fears that the Spectrum would mean the end of the market for the ZX-81, the price reduction to slightly less than £50 and the expansion of retail outlets has resulted in demand to revive the machine so that it occupies a position as the perfect introduction to the world of computers. Only Binatone with its threatened £50 unit, yet to see the light of day, has shown any interest in attempting to provide anything like the same computing power at such a reasonable price.

No doubt someone will attempt to introduce a cheaper, more powerful, machine but for it to approach the sales of the ZX-81 it would need to start with the kind of support industry in software, hardware and information which has built around the Sinclair machine in the last 12 months.

Which brings us to what may be the high spot of the year for anyone interested in following the fortunes of



Sinclair and his company. In keeping with the last three years, the company is intending to launch another new machine. It is still at the development stage but Clive Sinclair has already given sufficient hints on what it will be like to be able to form an idea of what will be on offer.

It will be another move up-market at a price expected to be much more than the Spectrum. The price alone is likely to mean that it will mark a move by Sinclair into the business market proper. Clive Sinclair has said that it will include the latest of his company's technology, which means a place for the Microdrive, the flat screen television, and the Prestel adaptor.

Apart from being bigger and better, the possibly revolutionary aspect will be the likelihood of it being fully portable. That means that, unlike the exciting Osborne machine, it will be possible to carry a full system without weight training beforehand.

Whatever the machine is like we can guarantee it will play its part in making 1983 another exciting year in the world of Sinclair computers. The developments have been so fast in the last year that by this time next year we can be sure that we will be looking back on a year when the capabilities of small computers have been greatly increased.

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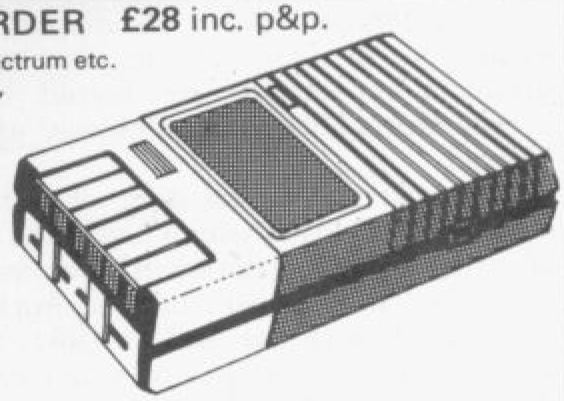
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Learning pack aids beginners

DURING the festive season many new owners of ZX-81s will be getting to know their machines. To help in the process, we have put together a special package. We introduced the offer last month but consider it to be so good that it is being repeated.

For only £26, we are able to offer the Sinclair Research Learning Lab and a year's subscription to the Sinclair User Club, the perfect companion to the ZX-81. If bought individually, the items would cost £31.95.

The Learning Lab contains eight cassettes and an explanatory manual intended to take people through all the stages of getting to know the machine.

There are many benefits to be gained from joining our User Club, as an increasing number of people from all over the world have been finding since it was started in June.

The list includes a telephone problem-answering service. Members can telephone at any time for

continued on page 8

Books offer reduces cost by 20 percent

STAR BARGAIN

TO LINK with our special learning offer we have decided to repeat last month's exclusive offer to club members.

From Read-Out Books and Software we have obtained for members a 20 percent discount on its full range of books.

The full range of books with the special prices, which are open only to its members, is given below.

From Micromega, publisher of business programs, we can offer 20 percent off all of its cassettes. They include **Compushare, Bank** and **Computax,** which have all helped to expand the uses for the 16K ZX-81. There are also two games tapes, one for the 16K and the other for the basic 1K ZX-81.

The offers are open only to members of the Sinclair User Club and are available until the end of January. To allow new members to take advantage of them, orders can be included with the membership application form which is part of the New Year Offer form below. Just tick the Membership Only box and include £12 to the address shown.

Please indicate which computer you own so that you receive the correct cassette.

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READOUT BOOKS AND SOFTWARE

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Gateway Guide to the ZX-81, Mark Charlton	£6.45	£5.20

Plus £1.20 postage and packing for each order.

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I wish to take advantage of the special New Year offer and enclose £26 for a year's subscription to the Sinclair User Club and a copy of the Sinclair Research Learning Lab.

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I own a Spectrum/ZX-81

Name..

Address..

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Send your coupons to Sinclair User Club, ECC Publications, 30-31 Islington Green, London N1 8BJ. Cheques should be made payable to Sinclair User Club.



The Sinclair User Club

continued from page 7
expert advice on problems they have in using their machines. The telephone number is given on the cassette-based news letter, which is sent every two months, and includes articles, helpful hints, games and news about the club.

Members can also take advantage of special discounts on various items in the Sinclair market, both hardware and software.

Each month there is a special offer which, in the last few months, has included a reduction in the prices of the William Stuart Systems ZX-81 Music Synthesiser, the Kempston Electronics click keyboard, the range of Thurnall Electronics add-ons, and many items of software. This month's offer can be seen on this page.

To take advantage of this exceptional offer, available only until the end of January, fill in the New Year Offer form below.

If you just wish to join the Sinclair User Club, all you have to do is tick the Membership Only box. If you wish to do that, however, you will have to pay the full subscription rate of £12 a year.

Make sure when completing the form to indicate whether you own the Spectrum or the ZX-81, so that we can send the correct cassette.

Britain

Aylesbury ZX Computer Club: Ken Knight, 22 Mount Street Aylesbury (5181 or 630867). Meetings: first Wednesday and third Thursday of the month.

Doncaster and District Micro Club: John Woods, 60 Dundas Road, Wheatley, Doncaster DN2 4DR; (0302) 29357.

Edinburgh ZX Users' Club: J. Palmer (031 661 3183) or K Mitchell (031 334 8483). Meetings: second Wednesday of the month at Claremont Hotel.

EZUG-Educational ZX-80/81 Users' Group: Eric Deeson, Highgate School, Birmingham B12 9DS.

Furness Computer Club: R J C Wade, 67 Sands Road, Ulverston, Cumbria (Ulverton 55068). Meets every other week on Wednesday evenings.

Glasgow ZX-80/81 Users' Club: Ian Watt, 107 Greenwood Road, Clarkston, Glasgow G76 7LW (041 638 1241). Meetings: second and fourth monday of each month.

Hassocks ZX Micro User Club, Sussex: Paul King (Hassocks 4530).

Inverclyde ZX-81 Users' Club: Robert Watt, 9 St. John's Road, Gourock, Renfrewshire, PA19 1PL (Gourock 39967). Meetings: Every other week on Monday at Greenock Society of the Deaf, Kelly Street, Greenock.

Keighley Computer Club: Colin Price, Redholt, Ingrow, Keighley (603133).

Merseyside Co-op ZX Users' Group: Keith Driscoll, 53 Melville Road, Bootle, Merseyside L20 6NE; 051-922 3163.

National ZX-80 and ZX81 Users' Club: 44-46 Earls Court Road, London W8 6EJ.

North Hertfordshire Home Computer Club: R Crutchfield, 2 Durham Road, Stevenage; Meetings: first Friday of the month at the Settlement, Nevells Road, Letchworth.

North London Hobby Computer Club: ZX users' group meets at North London Polytechnic, Holloway Road, London N7 each Monday, 6pm.

Nottingham Microcomputer Club: ZX-80/81 users' group, G E Basford, 9 Holme Close, The Pastures, Woodborough, Nottingham.

Orpington Computer Club: Roger Pyatt, 23 Arundel Drive, Orpington, Kent, (Orpington 20281).

Perth and District Amateur Computer Society: Alastair MacPherson, 154 Oakbank Road, Perth PH1 1HA (29633). Meetings: third Tuesday of each month at Hunters Lodge Motel, Bankfoot.

Scunthorpe ZX Club: C P Hazelton, 26 Rilestone Place, Bottesford, Scunthorpe; (0724 63466).

Sheffield: Andrew Moore, 1 Ketton Avenue, Sheffield S8 8PA would like people interested in starting a club in the area to contact him enclosing a stamped-addressed envelope for details.

Sittingbourne: Anurag Vidyarthi (0795 73149). Would be interested to hear from anyone who wants to start a club near the Medway towns.

Swindon ZX Computer Club: Andrew Bartlett, 47 Grosvenor Road, Swindon, Wilts SN1 4LT; (0793) 3077. Monthly meetings and software library.

Thames Valley ZX Users' Club: Richard Shepherd, 22 Green Leys, Maidenhead, Berkshire SL6 7EZ; (0628) 21107 (evenings and weekends). Hopes to start meetings on a regular basis.

Worle Computer Club: S W Rabone, 18 Castle Road, Worle, Weston-super-Mare BS22 9JW (Weston-super-Mare 513068). Meetings: Woodsprings Inn, Worle, on alternate Mondays.

ZX-Aid: Conrad Roe, 25 Cherry Tree Avenue, Walsall WS5 4LH (Walsall 25465). Please include sae. Meetings twice monthly.

ZX Guaranteed: G A Bobker, 29 Chadderton Drive, Unsworth, Bury, Lancashire. Exchanges information and programs throughout the country.

ZX-80/ZX81 Users' Club: PO Box 159, Kingston-on-Thames. A postal club.

Overseas

Belgium, France, Luxembourg: Club Sinclair, Raymond Betz, 38 Chemin du Moulin 38, B-1328 Ohain, Belgium (322 6537468)

Belgium, Netherlands: Microcomputer Vereniging BZW, Paul Glenisson, Priester de l'Epéestraat 14, B-1200 Brussels, Belgium (322 7349954)

Denmark: Danmarks National ZX-80/81 Klub (DNZK), Jens Larson, Skovmosevej 6.4200 Slagelese, post giro 1 46 24 66.
ZX-Brugergruppen i Danmark, Boks 44, 2650 Hvidovre. Gratis medlemskab og gratis blad til enhver interesseret.

East Netherlands: Jonathon Meyer, Van Spaen Straat 22,6524 H.N. Nijmegen; (080 223411).

Germany: ZX-80 Club, a postal club; contact Thomas Jenczyk. Hameln, Postfach 65 D-3250 Hameln, Germany.

Indonesia: Jakarta ZX-80/81 Users' Club, J.S. Wijaya, Jakarta, Indonesia.

Republic of Ireland: Irish ZX-80/81 Users' Club, 73 Cnoc Crionain, Baile Atha, Cliath 1.

Singapore: Sinclair Users' Group: Eric Mortimer, 1D Wilmer Court, Leonie Hill Road, Singapore.

South Africa: Johannesburg ZX80/81 Computer Users' Club: S Lucas, c/o Hoechst SA (Pty) Ltd, PO Box 8692, Johannesburg. Teaches Basic and machine code, interest in hardware.
Johannesburg ZX Users' Club: Lënnërt ER Fisher, PO Box 61446, Marshallstown, Johannesburg.

Spain: Club Nacional de Usuarios del ZX-81, Joseph-Oriol Tomas, Avda. de Madrid, No 203 207, 10, 3a esc. A Barcelona-14 Espana.
International ZX Spectrum Club: Gabriel Indalecio Cano, Sardana, 4 atrico 2a, San Andres de la Barca, Barcelona. Send international reply coupon. Produces a bi-monthly magazine.

United States: Bay Area ZX-80 User Group, 2660 Las Aromas, Oakland CA94611. — Harvard Group, Bolton Road, Harvard MA 01451; (617 456 3967).

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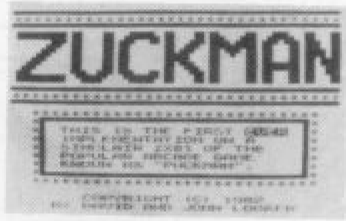
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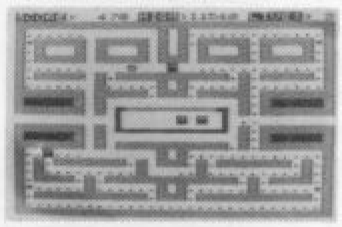
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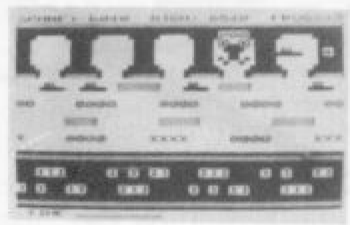


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Microdrive is a 'floppy' tape

THE ZX Microdrive is to be a floppy tape. Despite the assumption for so long that the much-heralded memory storage would be some kind of disc we can reveal exclusively that it is a tape loop.

That would explain why the average response time is 3.5 seconds. Information will have to be stored in series so that if a piece of data is needed the whole tape has to be sorted through. A disc system would allow random access and would reduce the response times greatly.

The cost of attaching the first Microdrive will be £80. The drive will cost £50 but an interface is needed which, with the RS-232 and networked interfaces, will cost £30.

The floppy tape is in a black case measuring 2 in. by 1 in. by ¼ in. deep. The tape inside is an endless loop, similar to that on a telephone answering machine, and it is narrower that normal cassette tape.

The latest news available on when it will be on sale is that it will be some time in the New Year, but it is unlikely to be early in that period.



HAROLD MAYES, production editor of SINCLAIR USER, pictured outside Buckingham Palace after receiving the MBE for services to journalism.

Mayes began his 52-year-career as a 15-year-old reporter on the CHRONICLE AND ECHO at Northampton, becoming sports editor by the age of 19. It was the beginning of a lifetime's connection with sports coverage which has included being Press and Publicity Officer for the 1966 World Cup.

He began his association with electronics in 1962 when he becamed publicity manager of Ultra Electronics. After a number of other associated posts he joined ECC Publications in 1977 as production editor of WHICH COMPUTER? and took the same job on SINCLAIR USER when it was started nine months ago.

Deliveries 'unaffected by strike'

SEVEN days' production was lost at the Timex factory in Dundee because of a dispute. Sinclair Research says, however, that it is not expected to affect deliveries despite the increase in orders before Christmas.

The workforce went on strike on Wednesday November 10 and, following strenuous efforts by both management and unions, production resumed on Monday, November 22.

According to management the dispute involved the suspension of five workers. The unions said that a shop steward had been sacked without the agreed procedure having been followed.

A spokesman for Sinclair Research said that stocks had been building up before the strike and there should be no problem with deliveries.

Spectrum school sales slow

THE SPECTRUM is lagging behind its competitors in the Department of Industrys Micros in Primaries scheme.

A spokesman for the Department said that 1,200 applications had been received for the scheme but only a few had been for the Spectrum. He added, however, that the scheme had not been running for long and thought the Sinclair machine may catch up later.

It seems that little help in this will be coming from schools in the country's largest education authority, the Inner London Education Authority. The staff inspector for educational computing, Derek Esterson, said that schools were being advised to buy the Research Machines 380-Z rather than the Spectrum or the BBC Model B .

"They are free to buy the other machines but they will not be able to take advantage of the authority's support services," he said. They have been based on the Research Machines Link 480-Z which had been available in the Department of Industry's earlier scheme for secondary schools and the cost of adapting that to other machines would be too great.

Another factor may be a rumour that Sinclair Research was demanding payment before delivery, which was not usual practice in education. That was denied by a spokesman for Sinclair, who said that, in common with all educational suppliers, the company is invoicing after delivery.

ASA criticises Sinclair

PRODUCTION delays with the Spectrum resulted in the Advertising Standards Authority receiving a record number of complaints.

That is revealed in the authority's latest report, which showed that there had been 109 complaints about delivery of Sinclair machines, the majority of which concerned the Spectrum.

The authority noted that Sinclair Research failed to withdraw the advertisements when it became clear that there were supply problems. It was also concerned that, despite the seriousness of the objections, a number of organisations continued to publish the advertisements.

One of those was *Sinclair User*. Terry Cartwright, managing director of ECC Publications which publishes *Sinclair User*, said that the magazine acted in good faith on the basis of assurances about the supply position from Sinclair Research.

Software expanding

THERE ARE moves for a big expansion in retailing of software for the ZX-81. W H Smith and a number of retailers, like Buffer Micro Shop in London and Microware of Leicester, have been selling a wide range of cassettes for some months. The number of outlets is likely to grow quickly in the next few months.

The large chains, such as Boots, Greens and Menzies, have also been selling the Sinclair range of software and are expected to be taking cassettes from other producers soon.

Prism Microproducts is considering expanding into the distribution of software through outlets it supplies and Sinclair Research is expanding its range.

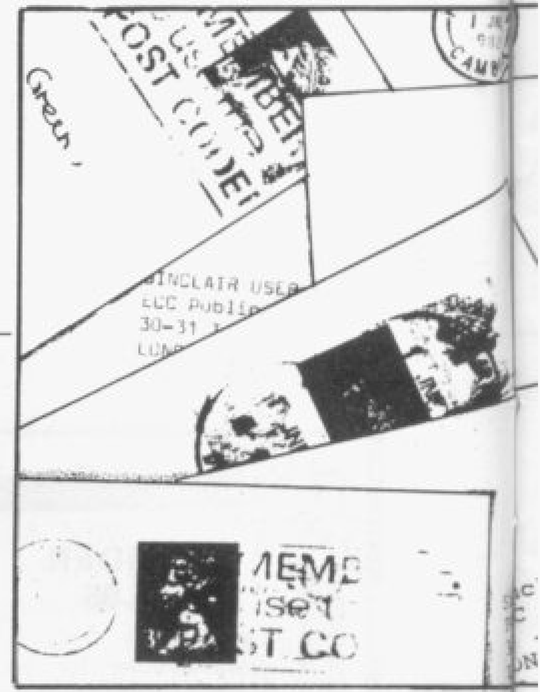
Course tries to improve micro selling

A NEW COURSE is being started by a London polytechnic to train sales staff for the growing number of high-street computer retailers. It is being run by the Polytechnic of North London and it intended to give people a thorough grounding in selling micro computers and associated computer systems.

Applications are being taken now for the course, run as part of the Government TOPS scheme. It will start in February and last five months. There are places for about 25 students.



Gap appears in market which needs to be filled



I TOOK the slightly unusual step of buying your magazine before buying a computer. Despite my lack of knowledge, I found the articles interesting and informative.

Due to your recent special offer, I was able to purchase a ZX-81 kit, which I put together easily. Sadly, it doesn't work. It was then that I realised that kit builders have very few information sources on which to draw. Is this a gap *Sinclair User* could fill?

I wrote to Sinclair describing the problems and the company replied within a few days to the effect that most faults are caused by poor soldering. It made me wonder how many people, as myself, may not know what a correctly-soldered component looks like and, presented with a machine which does not work, either give up or poke around causing real problems.

Perhaps an illustrated article showing the correct methods for handling components and building the ZX would help the would-be kit builder; no doubt mistakes occur in the same areas repeatedly and they would be highlighted.

Before learning to debug programmes some of us would like to learn to debug the computer perhaps It is possible to return the unit to Sinclair, of course, but how much better it would be to finish the job oneself.

G Williams,
Birmingham.

We have published a new magazine, Sinclair Projects, *to deal with problems like this.*

Copyright worries

I AM very concerned about the topic of program copyrights. One of the reasons for buying a home computer as powerful as the Spectrum is to play faithful copies of arcade games hour after hour economically, and in the comfort of one's own home.

I would like to feel confident that if a new arcade game is invented one of the better software houses would produce a copy for the Spectrum without being hounded into changing it beyond recognition by a company which would not think of producing a copy itself.

Paul Edson,
Aylesbury, Bucks.

Cassette for 1983 tax

WE WERE delighted that the November issue of *Sinclair User* contained favourable reviews of our ZX-81 software products Comp-U-Share and Comp-U-Tax (Income Tax). I would like to make one point clear to your readers. Your reviewer refers to Comp-U-Tax being valid for the year to April 5, 1982, which was correct for the product provided to him for review.

We have, however, now released the annual update for the year to April, 1983 — the current tax year — which incorporates some improvements but should at the same time be familiar to existing users of the earlier product.

This confusion arose because we do not release for review, or any other purpose, products until they are fully operational and we are confident that we can supply them from stock.

R E Cooke-Hurle,
Managing director,
Micromega,
230-236 Lavender Hill,
London SW11.

Growth in 'Vapourware'

I WAS pleased to see your editorial in the September issue on the subject of what can be termed 'vapourware'. There is plenty of it about and anything magazines can do to help readers know what is really available when advertised would be a boon to them, although a curse to the advertisers.

Apart from the chain promises on my Spectrum, the last one being given to me as 'another two weeks' by telephone as the postman rang the doorbell to deliver the parcel, I have suffered from Microl Spectrum USE & LEARN, non-delivery and cancelled after one month; R&R Software, Golf delivered by return post; Adda Computers, printer interface ordered five weeks ago and I cannot get a word from the company; Hewson Consultants, 20 programs for Spectrum — I cancelled after 14 days; Bug-Byte, Spectral Invaders, delivered by return; Harris & Lochyer Associates, Spectrum keyboard did not get into production.

Apart from the two software firms, it frustrates one and makes one doubt the promises given to one by suppliers who are probably truthful. I feel that my best way of getting add-ons will be through a local shop, Microware — in Leicester — where if it is in stock I can have it, but it restricts my choice not being able to rely on advertisers in the computer press.

May I be permitted to make two comments about *Sinclair User*. Some of the printouts are of such poor quality that they are no advertisement for the Sinclair printer, let alone being tantamount to unreadable. Of course, as you say, they should be computer printouts but you ought not to pay good money for inadequate



printing. The alternative would be for submissions to be on cassette and you do the printouts which we could then read.

Second, I was delighted to see that an EPROM blower had won a competition. To give it two pages without any construction data for hardware buffs was a waste of paper. We would be well served if it had been a constructor article.

Keep up the good work.

Alan Batch,
Rugby.

To answer your problem about the EPROM blower we have started a new magazine called Sinclair Projects *intended for people who enjoy building hardware items for their machines. In the first issue, which appeared in November, we included an article giving details of the blower.*

Courage needed for machine code

YOU SEEM to be serious about trying to make sense out of that shambles of a series on machine code. Where do you get such courage? After a full page of the wonders you were going to offer us you said:

"When the program (figure one) is in, then type POKE 16514,128." It took dozens of attempts and restarts to discover that it should have read. "... is in, *do not run it*, but instead type. . . ." which was the only way I could get it to work as described.

Then came the gem: "*Then* we can enter our first machine code program *but previously* we call a machine code program."

Apart from the logic of "Then — but previously," I was still under the impression that I would find what a machine code program looked like, and "enter" and "call" it later but I understood 10 LET A = USR (16514) and entered that.

Was there now a machine code routine at address 16514 or was I supposed to put one there? and did line 10 tell the "program flow" to execute it there and then or later? Had I given a value to 'A', whatever 'A' happens to be; were the 'B' and 'C' register alike now and, if so, how could I use it 'to advantage'?

The next two items of comprehensible information proved to be a table of instructions and a paragraph of instructions. On closer study they proved to be one item of information written two ways. I have given up long ago on explanations but I can understand the 'instruction, '1 NEWLINE' and when I type it half the program vanishes, never to be seen again.

I am a ZX-81 owner with a few weeks' experience. Half a million ZX-81s have been sold within the last year or so. That works out — on a ZX-81 if you own one — that nearly all those half million Sinclair users have also only a few weeks' experience, or months at the most,

continued on page 18

Basic video inversion

ON READING the August edition of *Sinclair User*, I noticed an advertisement and subsequent article promoting various pieces of hardware designed to give the ZX-81 an inverse video option.

Although inexpensive, the devices require that the owner drills holes in or re-wires his/her machine in a manner many users would consider to constitute mis-treatment of what may well be their best friend. The function can, of course, be performed by a Basic routine, though you would need an alternative equally absorbing pastime to occupy your mind during its execution.

There is nothing simpler in machine code programming than to provide yourself with just such a facility. I offer a routine which could sit neatly in a one-line REM statement at the beginning of the program, i.e., 5 REM 1234567-890123456789.

The sequence would then be POKEd into addresses 16514-16532. This may then be called whenever required from within the Basic program with an instruction such as:

LET A = USER 16514

Much better than defacing a friend.

Phil Lester,
Leverstock Green,
Hemel Hempstead.

Screen invert routine for ZX-81

Step	Mnemonic	Code (HEX)	Decimal
1)	Ld HL (NN)	2A OC 40	42 12 64
2)	Ld C,N	OE 16	14 22
3)	Ld B,N	06 20	6 32
4)	Inc HL	23	35
5)	Ld A (HL)	7E	126
6)	Add A,N	C6 80	198 128
7)	Ld (HL),A	77	119
8)	DJNZ -7	10 F9	16 249
9)	Inc HL	23	35
10)	Dec C	OD	13
11)	JRNZ -13	20 F3	32 243
12)	RET	C9	201

1) Loads HL with the system variable DFILE.
2) Loads C with the amount of lines on the screen.
3) Loads B with the amount of characters per line.
4) Increases HL.
5) Loads A with the contents of HL.
6) Inverts the character in A.
7) Loads the inverted character back into HL.
8) Decreases B and jumps back to step 4 if B is not zero.
9) Skips over each 33rd (newline) character.
10) Decreases C.
11) Jumps back to step 3 if that last step did not result in zero.
12) Returns to Basic program.



continued from page 17

because the ZX-81 is essentially a first-time buyers' computer, the only really suitable computer for a first-time buyer, in fact.

What we are doing is learning the particular delights of presenting precisely-defined instructions in a strictly logical manner — to our computers and to one another. What a pity *Si clair User* cannot share that pleasure.

Norman Gale,
Boston, Lincs.

Printout welcomed

WITH ALL the people who complain about the printing in the program printout, I feel I must say a few words of praise for you. I have bought *Sinclair User* since April with the exception of June, and in all my copies I can find only five programs spoiled by the methods of printing. I think it makes the layout look better and I like it.

Also I have a hint for RAM wobble. I cured mine by using the point of a pair of scissors to press in the connectors to make the connection stronger with the ZX-81 edge connector. This makes it more difficult to take off and put the RAM pack on, but stops wobble. Also type this in with 16K:

```
10 LET LINE 20=USR 12345
20 RUN USR 5
```

A reader,
Dorking, Surrey.

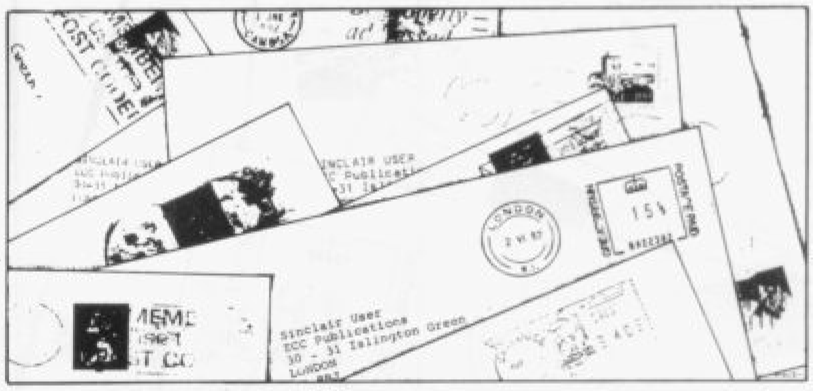
Penfriend corner

I WOULD like a pen-friend who has a ZX-81 with whom I can exchange programs and other things.

Han Loke Su,
Blk. 108, 280D,
Toa Payoh,
Lor. 1 S1231,
Singapore.

I WOULD like a pen-friend of about 14 who owns a Spectrum so that we could swap ideas and programs.

Steve Kaul,
143 Gipsy Road,
Welling, Kent.



Praise for Sinclair

HAVING READ page iii of *Spectrum User*, November, 1982, I felt compelled to redress the balance. I had to wait 15 weeks for delivery but was rewarded for my patience with an excellent microcomputer, a free cassette and a £10 voucher. After a few days' use the power supply unit failed. I was crestfallen.

I telephoned 0276 685311 (See John Catterall's letter) and three-and-half days later received a replacement power supply unit. If one works out the logistics I think it would be impossible to reduce that time. Good going, Sinclair.

As an innovator myself — recipient of more than one official award for my work — I can understand how unforeseeable difficulties can upset delivery promises and a good deal of innovation certainly went into the Spectrum. Undue modesty can also upset delivery by demand far exceeding expectation — see Inside Sinclair, pages 26, 27.

I am already looking forward to replacing Spectrum with Son of Spectrum, probably by early 1984.

Ronald Edge,
Solihull,
W. Midlands.

Dry paper advice

USERS of the Sinclair printer who have been having difficulty getting a solid black print might like to try baking the paper very gently in an oven.

Aluminised paper is hygroscopic and will absorb any available moisture, making it difficult for the stylus to burn through the aluminised surface in the time allowed.

Always store your spare rolls of paper in their original sealed packages to keep them dry.

B Wigglesworth,
Wateringbury, Kent.

Clean printer runs better

THE FOLLOWING tips may be of use to owners of Sinclair printers. After some time in use, and particularly after putting on a new roll of paper, the feed mechanism operates weakly, causing printing to be compressed vertically. Wiping the rubber drive roller with an acetone-moistened cloth removes a deposit of carbon from it and the paper then feeds properly.

On two occasions, with different printers, the mechanism has jammed. The symptoms are rather like a jammed car starter; there is no response to LPRINT or COPY commands and if the feed button is pressed there is a subdued click but no movement.

If the bottom of the printer is removed, you will see a large nylon gear. Rocking it gently frees the mechanism — on one occasion a large lump of carbon fell out and I suspect that is the usual cause of jamming. Remember, however, that attempting your own repairs will probably invalidate the guarantee. I would certainly not recommend attempting to disassemble the printer any further.

I find also that the same printer operates differently on different ZX-81s; on some it seems very tired. On the Spectrum, it fairly thrashes away and I suppose that is due to a difference in the current available from the computers.

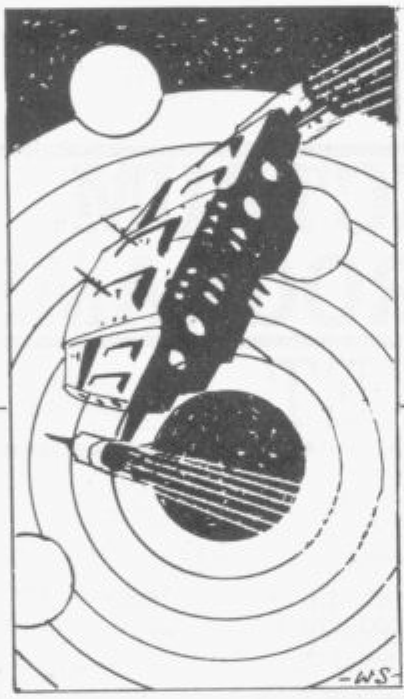
Colin Dickinson,
Canterbury, Kent.

Spectrum noise annoys

DO YOU or any of your readers know whether it is possible to get rid of the noise the Spectrum makes? If so, how?

P Bankes,
Debenham, Suffolk.

So far as we are aware it is impossible to stop the low buzzing once the Spectrum is switched on.





Travelling in time is proving difficult

COMPUTER GAMES are becoming more complicated every month but Quicksilva, the manufacturer of a new game for the 48K Spectrum called **Time Gate,** claims that the game is the ultimate sci-fi arcade adventure.

The game is loaded in two parts. First, the lengthy instruction manual is loaded. That indicates to the player that the object of the game is to destroy a race of aliens called the Squarm who have invaded and taken over the Earth. The player must locate and travel through a series of time gates to various periods of history to find and destroy the head quarters of the Squarm.

The player must destroy as many aliens as possible in the search for the base, as the score is based on the time the mission takes and the number of craft destroyed before finishing or aborting the game.

If damage is sustained in space battles the player can land on a planet to do repairs and re-fuel. There are three types of planet and four types of alien craft with which to contend.

The most amazing thing about the game is the graphics. The player looks through the window of a space-craft at a three-dimensional view of space. The alien craft and the planet surfaces are also three-dimensional.

The sound effects have an arcade-style quality. The game has a high-score facility but high scores are difficult to obtain and we managed only 330.

Time Gate is available from Quicksilva, 92 Northam Road, Northam, Southampton, Hampshire, and costs £6.95.

Scrambling for points

A FAST and furious fight through the air is promised with the Mikro Gen **Scramble,** a better-than-average version of the popular arcade game. The game can be played in fast, normal or slow modes but it is better to play it in slow mode if you are a beginner with this kind of game.

The game goes through four sectors in which missiles, UFOs, meteors and fortresses provide obstacles for your fighter aircraft as it shoots across the sky.

The player is provided with weaponry of laser and smart bombs. Even they are not sufficient to deal with the missiles and UFOs.

Scramble is available from Mikro Gen, 24 Agar Crescent, Bracknell, Berkshire and costs £5.50 plus 50 pence p&p.

Work Force has produced a less interesting version for the 16K Spectrum.

This version of Scramble uses only the missile stage That does not detract from its playability and in some ways it is more difficult than its bigger brother. The missiles are certainly larger and the large player ship is an easy target.

An unusual feature is that you can steer the ship diagonally, although if you use those control keys as well as the others you could become confused. The controls are set out on the keyboard as if a joystick was being used. At some stages you could begin to feel like a contortionist grappling at the controls.

Apart from the difficulties with the controls, Scramble is an exciting and addictive game which can be speeded using the thrust control. It is produced by Work Force, 140 Wilsden Avenue, Luton, Beds, and costs £4.95.



Improving asteroids

ASTEROIDS seems to be a popular game at the moment for both Sinclair machines and each version is better than the last. **Meteoroids** is an asteroid-type game for the Spectrum and is produced by Softek, a relative newcomer to the Sinclair scene. The meteors are three-dimensional and are of three types, ranging from small meteorites to large meteoroids.

The game is fast but even though you can score a maximum of 200 points for hitting a large meteoroid, a high score is difficult to achieve.

The player's ship can rotate in both directions, can move across the screen, and go into hyperspace. One added extra is a shield which can be used if the ship is about to be hit by a meteor. Each time the player fires the laser a volley of four shots blasts into space.

The instruction leaflet offers various methods for getting out of tight spots. Meteoroids is produced by Softek, 329 Croxted Road, London SE24. It costs £4.95.

Pimania is going for gold

PIMANIA is a fascinating adventure game which has the added compulsion of a prize offered by the manufacturer to the first person who reaches the end of it.

The idea is to pass through a series of Pi-gates which exist in different places in space and time and eventually to find the place in space and time where the Golden Sundial, the prize, has been hidden.

To start the game the players must push the proper key on the keyboard. When first confronted with the task, the problems facing the adventurer seem impassable but the answers are so easy. In fact, it takes a child's mind to determine some of the clues.

The graphics are excellent and the Pi-man, a little cartoon character who can help or hinder the player, is an amusing and brilliant creation.

Some people may not buy the game because they think that when the competition is over the game will no longer be fun. That is not true, as it has many twists and turns before the final answer is found. Locating most of them will take months.

It is the best adventure game we have reviewed for the 48K Spectrum and 16K ZX-81. It is available from Automata Cartography Ltd, 65a Osborne Road, Southsea, PO5 3LR, and costs £10.

The spy with the golden chip



NOW James Bond has managed to find his way on to the 48K Spectrum in an adventure game called **Shaken but not Stirred.** The game is in two parts. In the first part a nuclear missile is abducted and the player, James Bond, must find and disarm it.

The first section of the game is a chase round the world, where Bond is threatened by spies, attacked by muggers and invited into taxis for secret meetings. At various points clues, in the form of anagrams, are given to the player to indicate where Dr Death's hideout is located. Once you have found that you can load part two of the game and visit Dr Death's island.

You must explore the island and attempt to discover the secret entrance to Dr Death's underwater hide-away. If you find it you will find yourself in a three-dimensional maze. You must find the control room and de-activate the deadly weapon.

To add to your troubles in the maze, a villain called Paws will stalk you and try to kill you. If you manage to find the control room and de-activate the missile, you must rush to London for your favourite drink, a Vodka Martini.

The game is a fast-moving, machine code adventure but stage one can be slightly monotonous as it is all too easy to be killed. There are also random elements in the game which hamper the planning of strategy.

Shaken but not Stirred is available from Richard Shepherd Software, 22 Green Leys, Maidenhead, Berkshire, SL6 7EZ. It costs £6.50.

Dreadful dwarf

MURDEROUS dwarfs, misty caverns and mysterious objects all play a part in the new Abersoft adventure game for the 48K Spectrum, **Adventure One**.

Anything can happen during the adventure but one thing to look for is a dwarf who throws knives. He could put a quick end to any adventuring.



The adventure is displayed as text on the screen and reads like a book written by Tolkien with shades of Agatha Christie included. It is ideal for a beginner at adventure games because the computer helps the player more than other games so far released for the Spectrum. The game should prove advantageous for the experienced Dungeons and Dragons player who cannot find a Dungeon Master against which to pit wits.

Adventure One is available from Abersoft, 7 Maes Afallen, Bow Street, Dyfed SY24 5BA and costs £9.95.

Little love from Remsoft

THE MANUFACTURER of a new adventure game for the ZX-81 specifies that it is for women. **Love**, from Remsoft, casts the player as an amorous woman in search of some fun. The player starts in the bedroom wearing pyjamas. There is a chest of clothes which the player can open and investigate.

The game is amusing at times although whether that is intentional or not is difficult to determine. There are hints about sex throughout the game, although the program vocabulary does not stretch that far.

Love is produced by Remsoft, 18 George Street, Brighton BN2 1RH. The game costs £5.95.

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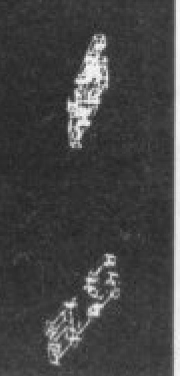
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VIEWPOINT

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Just starting to write machine code programs? The ideal assembler for beginners is Ultraviolet. Look at the facilities that it offers:

Works entirely in decimal (no hex problems); all Z80 instructions correctly assembled; supports the pseudo-instructions EQU, ORG (multiple ORGs allowed), DEFB, DEFW and DEFS; code can be assembled at one location and then relocated; allows alphanumeric labels of any length; full listings of assembled code and mnemonics can be output to the printer; full error trapping with faulty instruction clearly indicated; comments can be included in the source file.

The ideal complement to Ultraviolet is Infrared - an easy-to-use disassembler.

So now there is no need to be intimidated by machine code - with Ultraviolet and Infrared it's child's play! Buy them from the machine code specialists - ACS Software.

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ACS SOFTWARE 7, Lidgett Crescent, Roundhay, Leeds LS8 1HN

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16K ZX81 Spectrum



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Can you compete with British Airways? You must decide on the number of aircraft to operate, whether to buy or charter, and the levels of staffing and maintenance. Problems encountered are tax demands, strikes, cancelled flights, hijacks and aircraft crashes.

DALLAS NEW

A game of oil exploration and exploitation in Texas. Decisions are required on purchasing concessions, the movement and use of drilling rigs, and the building of platforms and pipelines. Can you take-over the Ewing Empire, or will you be taken-over in the attempt!

AUTOCHEF

As MD of a Catering Company you must negotiate for leases, decide on menu prices, level of wages, advertising and dividends. Each year you must predict the inflation rate. You will be made to resign if you are not successful. There are 3 levels of difficulty.

PRINT SHOP

You own a small printing company and are required to decide on (a) the number and type of staff you employ and when to increase or reduce staff (b) the amount and type of paper you stock (c) the week in which work is scheduled (d) the quotation for each. There are 3 scales of difficulty.



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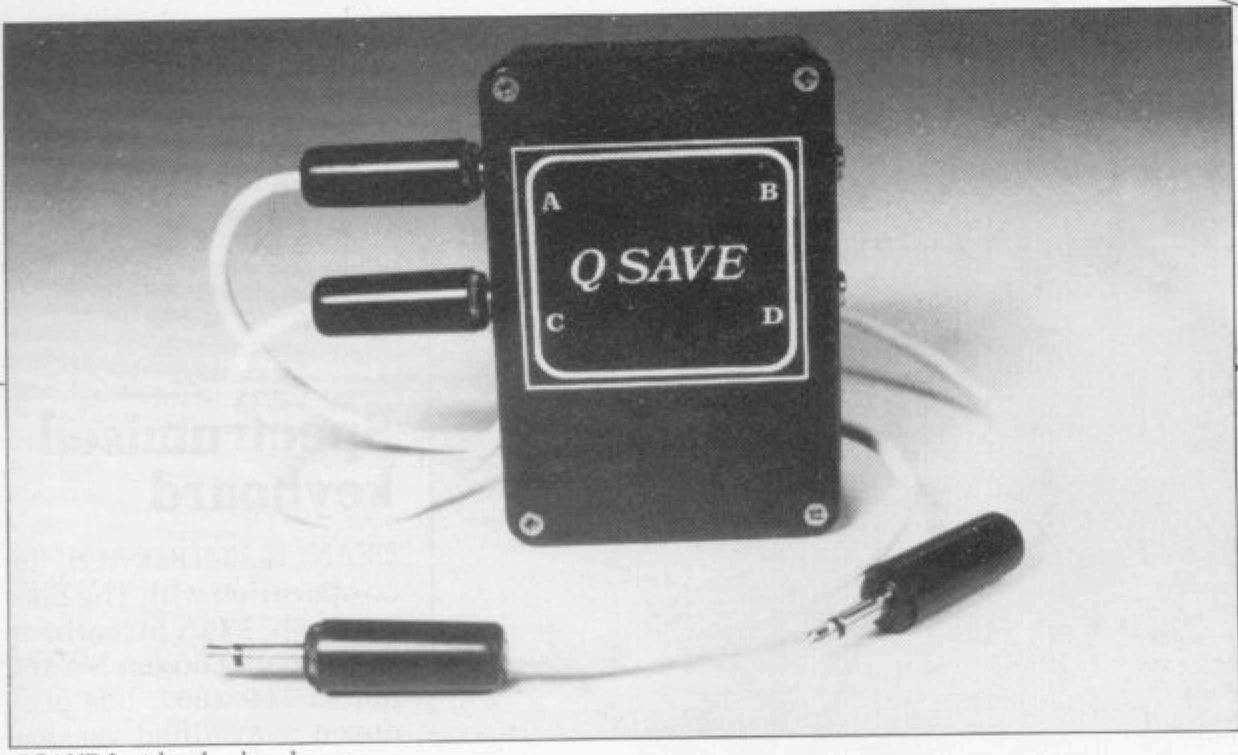
PRICE ZX81 or Spectrum: Airline, Dallas, Autochef, Print Shop — £5 each. Modeller X — £8.
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LONDON	Data-assette, 44 Shroton Street, N.W.1.
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BATH	Micro Style, 29 Belvedere, Lansdown Road.
BOURNEMOUTH	Zedxtra, 5 School Lane, Kinson.
DAVENTRY	Micro Style, 67 High Street.
LEICESTER	Microware, Unit 5, St Peters Lane.
MANCHESTER	Micro-Link, 830 Hyde Road.
	J.M. Computers, 136 Park Lane, Whitefield.
NEWBURY	Micro Style, 47 Cheap Street.



QSAVE fast loader hardware

Loading in the fast lane

THE MOST exciting product being reviewed this month is QSAVE by PSS. It is a hardware and software package which will allow you to save and load tapes at 16 times the speed of Sinclair ROM commands.

The hardware consists of a small black box which plugs into the ZX-81 EAR and power sockets via two 3.5mm. cables. The power supply and EAR lead from the tape recorder are plugged into two 3.5mm. sockets on the other side of the box which contains an amplifier and two filters which eliminate any noise produced by the tape recorder. It also cleans the signal which has been recorded and can be used on its own to improve the loading of machine code or Basic tapes.

The software does the tricky bit and has to be LOADed first in the normal way before QSAVE can be used. It Auto-Runs and transfers a 300-odd-byte machine code program above RAMTOP. There it will stay unless you remove the power or use the NEW command. PSS will provide a tape for use with any memory size.

Three routines are provided via PRINT USR X where X is the routine required. They are SAVE-VERIFY and LOAD. They will enable you after you have LOADed a Basic program in the normal way to re-record it in QSAVE format — 16K takes 30 seconds.

After re-winding the tape it may then be verified and checked against what is stored in memory. LOADing of any program QSAVEd must be done by the LOADing routine provided. As it takes only 30 seconds to LOAD a program of up to 16K that does not take long; if the VERIFY command does not recognise the QSAVE program it will not return to Basic, so the only way to get out of it is to load known loadable tape.

That is its major failing but PSS says it will be corrected by now.

The price is £15.95 inc. VAT and postage — 64K version £17.95. A version with a switch prevents you having to pull out the EAR lead of the cassette recorder when SAVEing. PSS is at 112 Oliver Street, Coventry CV6 5FE, tel: 0203-667556.

Battery RAM kit

A CMOS battery-backed RAM board for the ZX-81 is available as a kit. The board has four sockets which can be used for 2K RAM chips (6116) or 2K and 4K EPROM and by placing the chips in different sockets it can be made compatible with other equipment — graphics ROMs, Toolkits — which inhabit the same 8K-16K space on the memory map.

The kit should take approximately two hours to make, Hunter Electronics says, and the RAM board can be moved to any 8K space in the 0-32K section of memory. It can then be used to modify the Sinclair ROM by replacing it with 8K of RAM which, because it has a lithium battery, does not lose the program when the power is turned off.

The expected life of 2K of RAM using the battery only is 10 months, or two months with a full 8K of RAM. The cost of the kit is £19.95 inc VAT, plus £1.95 for postage. It is supplied with only one 2K of RAM on board. Hunter Electronics is at PO Box 5, Axminster, Devon EX13 5AS.

RD ports for Spectrum

RD LABS has made most of its range of input/output ports Spectrum-compatable. So the scientific or educational user has a wide range of test equipment at his disposal. Devices include digital I/O ports, analogue inputs to one port and a real-time clock.

The clock is battery-backed and has a calendar, as well as the time protected for up to four months without power.

All the units are memory-mapped and Spectrum users require an adaptor as well as the basic motherboard and ports. The prices range from £33.93 for the digital port to £51.24 for the real-time clock/calendar. The Spectrum adaptor costs £9.50 extra.

There is a 10 percent discount for cash with order but you must add £3 postage to the VAT-included price.

RD Labs also does mainframe units for industrial users; price on application to RD Labs, 5 Kennedy Road, Dane End, Ware, Herts SG12 0LU. Tel: 0920-84380.

Keyboard overlays

ANOTHER hardware/software combination is from Quicksilva which now supplies keyboard overlays for its Spectrum games — Space Intruders and Meteor Storm. The black pieces of plastic fit over the keys and are real-

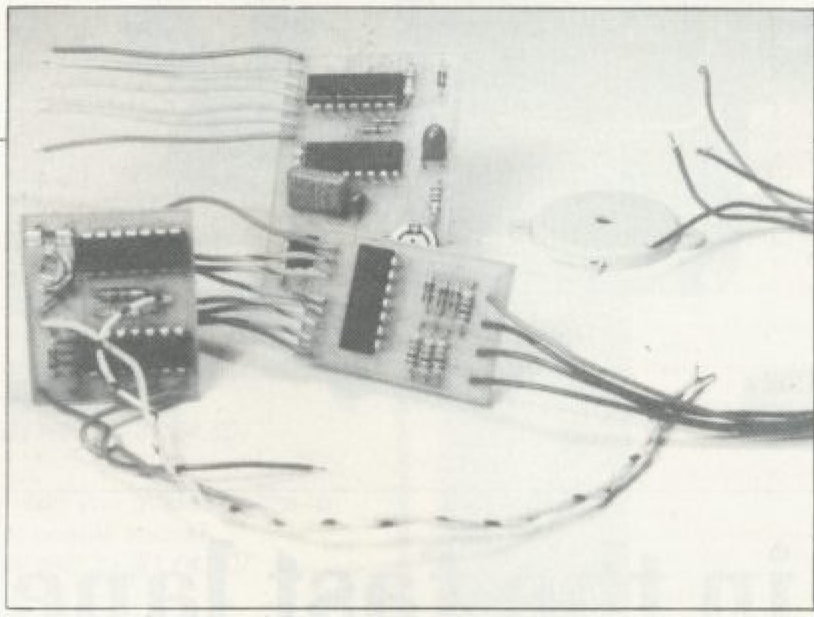
continued on page 24



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ly convenient as they tell you in bold letters which is THRUST-ROTATE LEFT and the like — a real incentive for buying the excellent QS games.

QS is at 92 Northam Road, Southampton SO2 0PB and the tapes can also be obtained through some micro shops specialising in ZX equipment.



Haven Hardware modules

Modules from Haven

HAVEN HARDWARE no longer offers the ZX-81 colour board due to the lack of a satisfactory modulator but will sell the circuit diagram for £4.95.

Haven sells three other modules. A single-entry key module can be soldered on to the ZX-81 or Spectrum, although the connections are different. It is ideal for those with an external keyboard with a few spare keys on it. It costs £2.95 as a kit and £4.95 made up but not fitted. The beeper is a standard oscillator which operates every time a key is pressed. It costs £8.90 and £7.50 as a kit. The third offering is an inverse video module but it tends to be unstable.

Haven Hardware is at 4 Asby Road, Asby, Workington, Cumbria CA14 4RR.

Spectrumised keyboard

DEAN ELECTRONICS, in co-operation with The Buffer Shop, 374A Streatham High Road, London SW16, tel: 01-769 2887, has produced a modified version of the ZX-81 keyboard for the Spectrum. It costs £35 and a black case to contain it and the Spectrum PCB will cost £15 inc. VAT.

They can be obtained only from The Buffer Shop and £1 must be added if ordering by mail for postage and packing.

The ZX-81 version has a space bar and a typewriter-style key layout — it is the same keyboard, but Spectrumised.


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MEMOTECH



MEMOPAK 16K For those just setting out on the road to real computing, this pack transforms the ZX81 from a toy to a powerful computer. Data storage, extended programming and complex displays become feasible.
For even greater capacity, memory packs can be added together (16 + 16 + 16K or 16 + 32K). The MEMOPAK 32K and the MEMOPAK 64K offer large memories at economical prices.

MEMOPAK HRG This pack breaks down the constraints imposed by operating at the ZX81 character level and allows high definition displays to be generated. All 248 × 192 individual pixels can be controlled using simple commands, and the built in software enables the user to work interactively at the dot, line, character, block and page levels. Scrolling, flashing and animation are all here.

MEMOPAK Centronics I/F The BASIC commands LPRINT, LLIST and COPY are used to print on any CENTRONICS type printer. All ASCII characters are generated and translation takes place automatically within the pack. Reverse capitals give lower case. Additional facilities allow high resolution printing. The full capabilities of your printer are now under the control of the ZX81.

MEMOCALC The screen display behaves as a 'window' on a large sheet of paper on which a table of numbers is laid out. The maximum size of the table is determined by the memory capacity, and with a MEMOPAK 64K a table of up to 7000 numbers with up to 250 rows or 99 columns can be specified. Each location in the table can be either a number which is keyed in or a formula which generates a number. Every time the command to 'calculate' is given, all the formulae in the table are re-evaluated. Spreadsheet analysis started as an aid to cash-flow analysis, but this powerful tool has now been generalised and MEMOCALC with its special ability to perform iterative calculations is invaluable in the performance of numerical tasks.

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realises the ZX81 potential

The Memotech approach to microcomputing is to take the well-proven and popular ZX81 as the heart of a modular system. This small computer houses the powerful Z80A processing unit and acts as the central processor module through which the MEMOPAKS operate.

Memotech has a reputation for professional quality, producing units which are designed to fit perfectly, to look well-balanced, and to work efficiently and reliably.

The modular approach gives ZX81 owners the freedom to design the system they really need. Furthermore, the intercompatibility of the modules ensures that later additions will click straight in, to give you a system that grows with your ambitions and abilities.

To ensure that your expectations are realised, care is taken at every stage to design features into the system to anticipate your frustrations and to forestall them. For example:

A) Memories are cumulative e.g. 16K and 32K can be added to the MEMOPAK 16K or even to the Sinclair 16K RAM pack.

B) The HRG firmware allows commonly used constructions (such as scrolling, shading and labelling graphs), which might otherwise be beyond the user's programming capabilities, to be evoked by a few simple commands.

C) The Centronics I/F converts ZX81 character codes into ASCII and extends the print line to the width of the printer, still using the LLIST, LPRINT and COPY commands.

As one example, a system with 16K of memory and MEMOCALC is all that is required to perform sophisticated numerical calculations giving the same results as a computer at 10 times the price. The problem may be as complicated as a cash flow or production schedule, or as simple as household accounts or pocket money budgeting. If the bank manager wants to see the cash flow, then a single print instruction to the Centronics I/F will give a printout which is more than acceptable to any bank.

The example system which is shown below, on the other hand, would satisfy the needs of someone who wanted to enter data via a light-touch keyboard, construct and label graphs, and then copy the screen to an 80-column printer. Only 16K of memory is used here but with additional memory, more than one video page can be stored. Up to 7 successive pages can be displayed cyclicly to give animated displays.

Looking forward, Memotech will continue to back the ZX81 through 1983 with fast storage devices, pressure sensitive electronic drawing boards and more software packs including a wordprocessor, an RS232 interface and a Z80 assembler.

MEMOPAKS may be ordered by post (cheque, Access/Barclaycard quoting number) or by telephone. Please make cheques payable to Memotech Ltd. and please include £2.00 per unit for packaging and postage inland (overseas £3.00).



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The ZX-81 cannot extract a white rabbit from a hat. It can do many things which seem impossible. Frank Adey investigates

Baffling tricks from the Magic Sinclair

IT HAS to be admitted that there is no way your ZX-81 can be programmed to extract a rabbit from a top hat but you can make it do a number of things which seem to be impossible. Here are a few examples using only 1K and you may be able to use the principles involved to design some baffling tricks of your own.

Take the old Find The Lady routine, otherwise known as Three Card Monte. Imagine that you hand a volunteer three cards, one of which is a Queen. You run a program. The computer instructs your friend to shuffle the cards, face down, and to type 'G' when he has finished. In addition, it displays the backs of three cards — shifted Hs. Once your friend has lost the Queen to his satisfaction, you hit the keyboard, and the ZX 'turns over' one of the cards, revealing a 'Q'. Your volunteer flips over the card he has at that position and the card is the Queen. Your ZX has found the lady.



To do the trick, you will need two things, program one and a Queen whose back has been marked subtly in some way to distinguish it from the other two cards. There are many ways of doing it. Buckle the card slightly, make a tiny crease with your thumbnail, use a barely noticeable pencil dot, or leave the card face down on a sunny window cill for two days until the colour of the back has faded sufficiently for you to be able to recognise it.

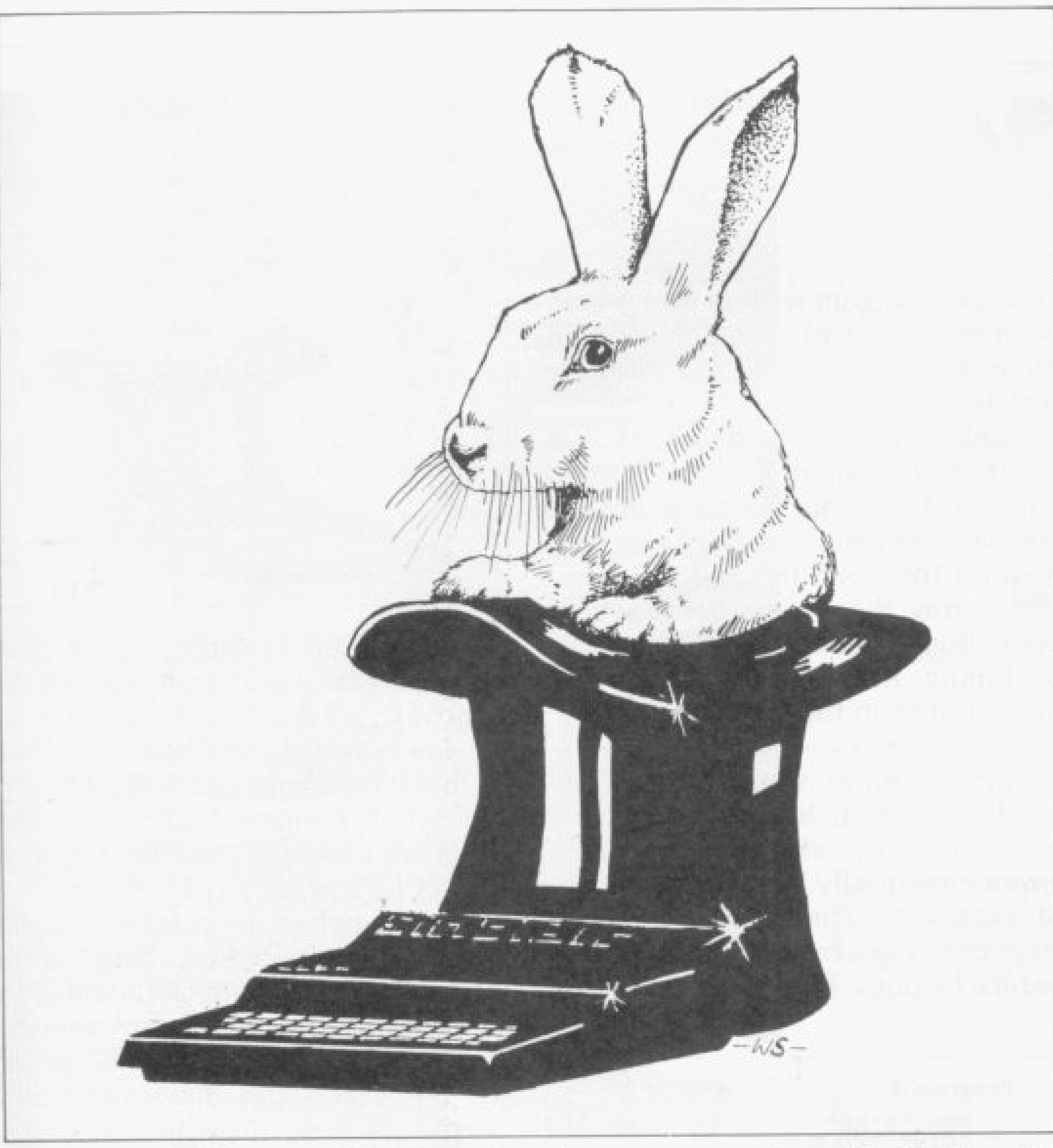
Next you have to let the ZX know where the Queen is, without telling your friend. This is how to do it. Run the program and you will see that although the computer is supposedly waiting for you to type G, no cursor appears on the screen. Do not worry; it is the last thing

Program 1

```
   1 REM "MONTE"
   2 PRINT "FIND THE LADY"
  20 PRINT AT 3,1;"MIX THE 3 CAR
DS FACE DOWN."
  30 PRINT "I BET I CAN FIND THE
 QUEEN"
  40 PRINT " TYPE""G""WHEN READY
..."
  43 PRINT AT 11,5;"shifted H";A
T 11,10;"shifted H";AT 11,15;"sh
ifted H"
  45 PAUSE 4E4
  50 IF INKEY$="F" THEN PRINT AT
 11,5;"Q"
  60 IF INKEY$="H" THEN PRINT AT
 11,10;"Q"
  70 IF INKEY$="H" THEN PRINT AT
 11,15;"Q"
  80 PRINT AT 15,5;"HOWZAT?"
  99~STOP
```

which will be noticed. What is happening is that the ZX is PAUSEing endlessly. A key you touch will make it snap out of it but we are interested only in three — F,G, and H.

Think of them as the possible positions at which the Queen can be found. If it is on the left, type F; if it is on the right, type H; and if it is in the centre, type nothing. Let your friend



hit the G. That last touch makes the whole thing seem totally innocent. Whatever happens, the ZX will check INKEY$ and display the Queen at the correct position. Don't feel nervous about hitting the F or the H; the ZX keyboard is so tiny that no-one can see what you are doing. Do not run the trick more than twice at a showing, or your victim may guess the method.

The next trick could have been made for the ZX but it was not — the first printed description of it appeared in 1612. It enables you to 'read the minds' of three people. The original version required the volunteers to take counters and you to do some awkward mental arithmetic. Program two mercifully is simpler.

You will need three volunteers. Explain to them that computers can be used to store and analyse the results of ESP experiments, thus reducing the chance of the experimenters 'unconsciously' cooking the books to produce favourable results. Offer to demonstrate.

Produce three pencils — any objects will do — coloured red, blue and yellow respectively, and lay them down near the keyboard. Run the program. It will display the words ESP TEST NO. 6, and the colours RED, BLUE and YELLOW, and the request ENTER THE INITIAL OF THE COLOUR YOU CHOSE. Turn your back on the screen and pencils.

Then, one at a time, your helpers take a pencil, hide it in pocket or purse, and type-in the relevant initial — R, B, or Y. When they have finished, you take a notepad and, after 'concentrating', tell each of them the colour he or she chose, writing the results in your notebook as you proceed. Amazingly, you are correct. Act as if this kind of telepathy is the easiest thing in the world and unconcernedly PRINT L;M;N to verify the results you have written on the pad. Your blasé attitude is designed to direct attention from the TV screen, which is the source of your telepathic knowledge. All you have to do is to remember the sequence in which your volunteers took the pencils. After the last one has typed-in his colour initial, the ZX will STOP, with a line number which tells you who took what. In your notebook you will have figure one, a tiny chart which related the final line number of the possible combinations of people and colours.

Figure 1.

	VOLUNTEERS		
CODE	1	2	3
9/11	Y	R	B
9/12	R	Y	B
9/13	Y	B	R
9/15	R	B	Y
9/16	B	Y	R
9/17	B	R	Y

Suppose the code and line number are 9/16. Looking at the chart, you will see that means that the first person took the blue pencil, the second the yellow pencil, and the third the red pencil. Moreover, the low line number — the highest possible is 17 — gives the impression of a short, simple program, free from hocus pocus, Remember, not to give the display more than a fleeting glance.

Program 2

```
   1 REM "ESP"
   2 PRINT "ESP TEST NO. 6"
   3 PRINT AT 7,16;"RED";AT 9,16
;"BLUE";AT 11,16;"YELLOW"
   4 PRINT AT 14,1;"ENTER THE IN
ITIAL OF THE COLOUR YOU CHOOSE"
   5 GOTO 20
  11 STOP
  12 STOP
  13 STOP
  15 STOP
  16 STOP
  17 STOP
  20 INPUT L$
  21 INPUT M$
  22 INPUT N$
  25 IF L$="Y" THEN GOSUB 1000
  30 IF L$="R" THEN GOSUB 2000
  35 IF L$="B" THEN GOSUB 3000
  40 LET N=N+10
  45 GOTO N
1000 IF M$="R" THEN LET N=1
1010~IF M$="B" THEN LET N=3
1020 RETURN
2000 IF M$="Y" THEN LET N=2
2010 IF M$="B" THEN LET N=5
2020 RETURN
3000 IF M$="Y" THEN LET N=6
3010 IF M$="R" THEN LET N=7
3020 RETURN
```

Program three is a legpull aimed at those irritating people who suggest that you cannot do much in lK. Ruefully agree with them, pointing to the ZX gazetteer system as a case in point. Explain that although, due to machine code

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programming, you can store virtually every place name on Earth, you have insufficient core to display a map of its location. Needless to say, your victim will not believe a word of it.

Offer to display 'just the map reference'. Run the program and have him enter a place name while you are out of the room. As soon as he had done so, the screen will clear and three mysterious-looking numbers will appear — the map reference. You return, skim through a gazetteer or atlas, and hesitantly name his location correctly.

Your know-all will at once assume that the 'reference' is arrived at by manipulating the character codes of the word he typed. Challenge him to crack the code. He will fail, because the numbers are meaningless. They are, in fact, generated at random.

All you have to do is get him to turn away from the screen for two seconds and you can discover his place name. The best way to do this is to place the gazetteer or atlas behind him, so that he has to turn to pass it to you. Failing that, leave the book on top of the TV, so that your body will block the screen for the vital instants.

Program 3

```
 1 REM "GAZ"
 2 PRINT "GAZETTER SYSTEM"
 5 PRINT "ENTER PLACE NAME"
 8 PRINT "(8 CHARS. MINIMUM)"
10 INPUT B$
15 LET A$=B$(1 TO 8)
20 CLS
25 LET C=1
30 FOR X=1 TO 15 STEP 5
50 PRINT AT 5,X;INT (RND*88)+1
55 NEXT X
60 PAUSE 4E4
65 PRINT AT 21,24;A$
70 FOR Y=1 TO 5
72 LET Q=333*67
75 NEXT Y
80 PRINT AT 21,22;"ten SPACES"
85 GOTO 90
90~GOTO 85
```

What happens is that after generating the bogus 'map reference' the ZX will PAUSE 4E4. As soon as you touch the keyboard, the first eight characters of the place name will flash briefly into view in the lower right-hand side of the screen. Then they will vanish and the program will go into a loop — lines 85 and 90 — which you will have to use the BREAK key to terminate.

Explain to your friend that it is another consequence of the limited core; so far as he is concerned, of course, the program has been in a loop all the time. In case you were wondering, the strange arithmetical operation in lines 70 to 75 is a means of timing the appearance of the place name on the screen.

The final trick — program four — requires ideally a pack of marked cards. You can buy them at most joke and toy shops, advertised eupheminstically as Magic (Secret Mark) Cards. The trick depends on your knowing a friend's chosen card before he does. If you cannot obtain any, you have to use a stacked deck. Arrange the Clubs, Hearts, Spades and Diamonds in order, with the cards in each suit in ascending order — your deck should start with Ace, two, three of Clubs, and end with Jack, Queen, King of Diamonds.

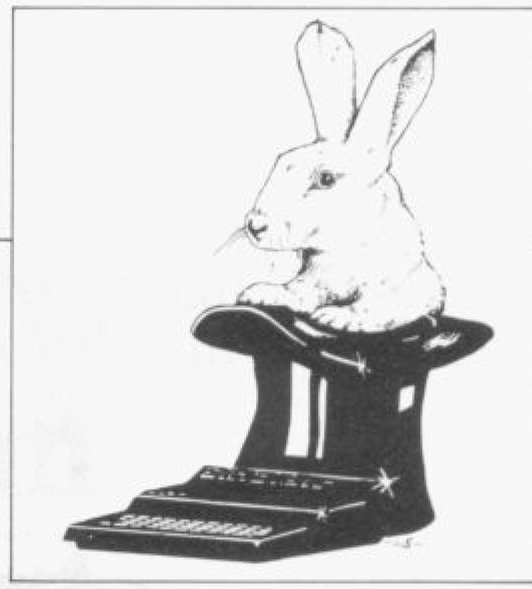
Program 4

```
 1 REM "STAR"
 5 PRINT "YOUR CARD IS..."
10 PAUSE 150
15 PRINT "THE FOUR OF CLUBS"
20~STOP
```

You will also need four program cassettes, one for each suit, with 13 mini-programs on each, one for each card. Keep them in separate pockets or otherwise handy and do not mix them.

If you are using a stacked deck the routine for marked cards will become obvious as we proceed. First, have your friend cut the deck a few times. Believe it or not, that does not affect the order of the cards. Now ask him to cut again but this time to take the top card from the bottom half of the deck, without looking at it.

As he does so, look at the bottom card of the upper half of the deck. Suppose it is the seven of Hearts. As the deck is in order, you know that his card must be the eight of Hearts. Immediately you produce the cassette with the Hearts programs



on it and hand it to him. Explain that the program on it is supposed to predict which card a person chooses. You do not believe it but perhaps he would like to load it and see what happens. Give him the program name, let him load it, and the ZX names his card.

To remember the program name for each card value, familiarise yourself with the mnemonic table in figure two. The last letter in each word refers to the number of one of the pip cards and the three court cards are very easy to memorise. With very little practice you should be able to whizz through the trick, amazing your friend and — you let him believe — yourself. Afterwards it is advisable to shuffle the cards.

Figure 2. Card mnemonics

Card	Progname
Ace is	WAND. There is one downstroke in the D and a wand looks like the numeral 1.
TWO is	DJINN. There are two downstrokes in the N, and two Ns in Djinn.
THREE is	CHARM. There are three downstrokes in a small 'm'.
FOUR is	STAR. R is the fourth letter in FOUR; four-star is a common classification.
FIVE is	SPELL. L is the Roman numeral for 50, and there are 5 letters in 'spell'.
SIX is	GUESS. S for 'six'.
SEVEN is	WARLOCK. 'K' can be made from two sevens (K), and 'warlock' has seven letters.
EIGHT is	MEPHISTO. 'O' is for 'Octopus' (eight arms) and 'Mephisto' has eight letters.
NINE is	IMP. The 'P' resembles a reversed '9'.
TEN is	HEX. X is the Roman numeral for 10.
JACK is	WIZARD.
QUEEN is	WITCH.
KING is	MAGIC.

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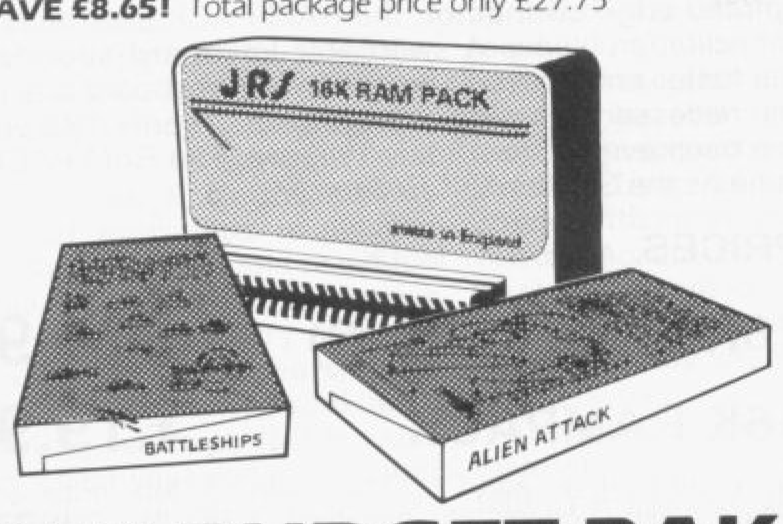
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For those with only a little knowledge of computers and their capabilities, the best way to approach the ZX-81 is to abandon any ideas for special uses. While the basic machine is ideal for learning how to use computers, it is too small for any major uses. It is better to become accustomed to the many facilities and then decide how you wish to use them.

Begin by unpacking the machine, overcoming your surprise at its size and weight and, following the manual, set up the system. If you cannot get the K on the screen, check that everything is plugged into its correct socket and re-set the machine by pulling-out the power plug for a second and try tuning-in again. If still nothing appears, check the power supply unit by shaking it. If it rattles, return it. If it is satisfactory, check your system with that of a friend.

Once the K appears you are ready to begin learning about the ZX-81. It can save family arguments if you can afford a separate television set for your system. It also makes life easier if you can find somewhere to leave your equipment set up permanently. You will find that a few power sockets are needed and a four-way block connector on a short length of extension cable will help to tidy trailing leads. The manual is written in great detail and is reasonably easy to follow. Some of the chapters may not seem immediately relevant but it is worthwhile reading them as you might miss something which is important.

Patience is needed at that stage to learn the ways in which the computer will accept information. It is tempting to try to enter programs before you are really ready but that is likely to lead to errors. For example, words like AND, THEN, and AT should not be typed-in letter by letter. By the time you have reached chapter 11, you should have accumulated sufficient knowledge to be able to type-in other people's programs, such as those in *Sinclair User* and *Sinclair Programs*, without too much difficulty.

It is important that when using the machine it is not jolted. Some of the connections can easily work loose and everything which has been put in will be lost.

The manual is not to everyone's taste and if you find it difficult to follow, a number of books on the market can help you. Find the one which suits you best.

As a way of relaxing, you can buy some of the growing range of commercially-produced software. That can be loaded directly from cassette but make sure that your machine is big enough to take the tapes you buy. There are some programs for the unexpanded 1K machine but most of them require a 16K RAM pack. The tapes vary in quality. It is advisable to read the reviews in *Sinclair User* and use your judgment to find the best.

An alternative method to learn about the ZX-81 is to plunge in at the deep end and see what the computer will do. Refer to the manual when you have difficulties. You can ignore the functions and calculations initially and experiment with PRINT statements to obtain the feel of the machine.

You may have heard already about the problem involved in SAVEing and LOADing your own cassettes. The manual again gives detailed instructions but many of the early machines would not accept tapes from some recorders. That problem is said to have been overcome but there can still be difficulties.

They usually occur when LOADing tapes recorded by other people. One simple method to overcome this is to wind the tape to the middle of the program and type LOAD" " followed by NEWLINE; then slowly increase the volume of the recorder with the tape running until the television screen shows four or five thick horizontal black bands. If you then re-wind the tape, the program should LOAD normally.

Finally, a health warning. Apart from any practical uses, computing with your ZX-81 can be a very entertaining hobby and is almost certainly habit-forming. You may easily find yourself crouched over your machine, red-eyed, in the early hours of the morning, thinking that in another five minutes you will sort out the problem.

Try to break that habit by getting into the fresh air and meeting other Sinclair users.

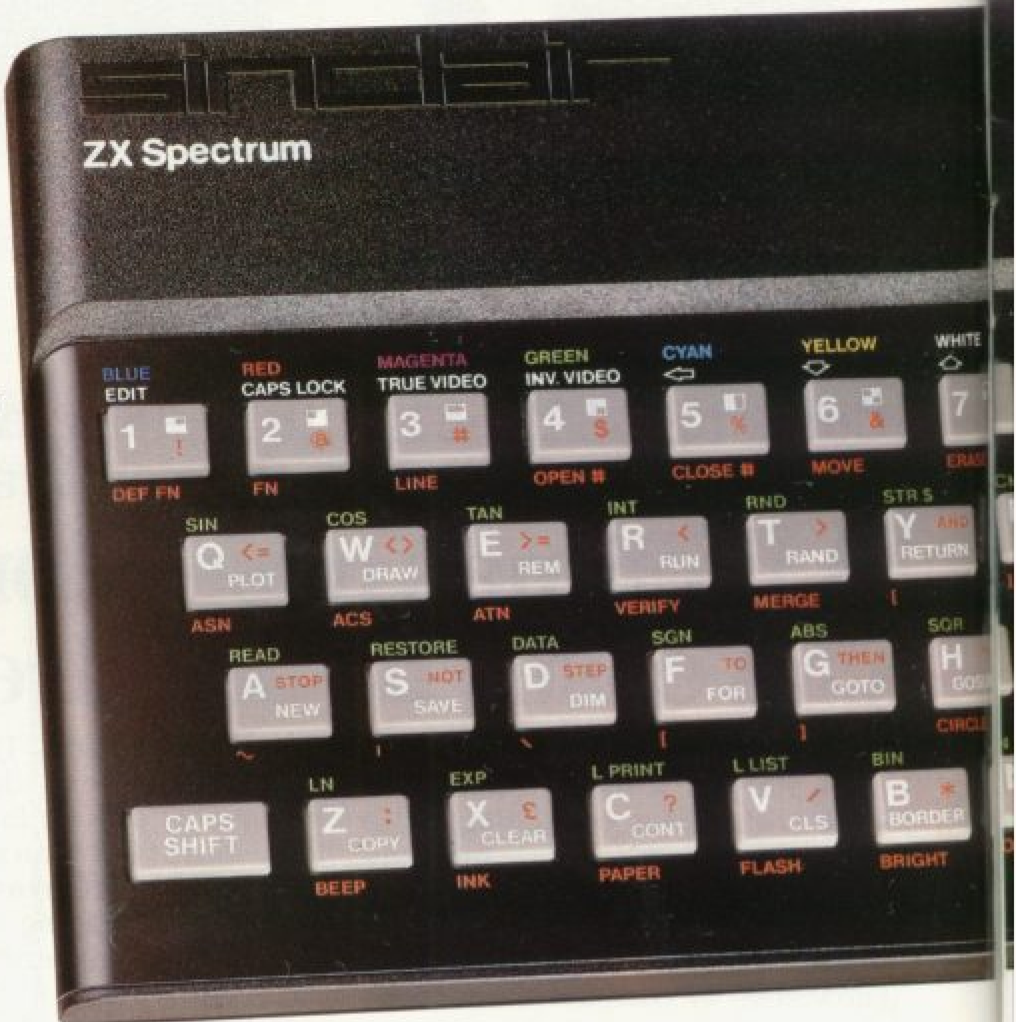
By obtaining a ZX-81 you find that you have joined a not very exclusive club with many thousands of members, many of whom would be only too happy to advise you if you have difficulties.

Make sure of your regular copies of *Sinclair User* and *Sinclair Programs* and you can be guaranteed many happy hours with your Sinclair machine.

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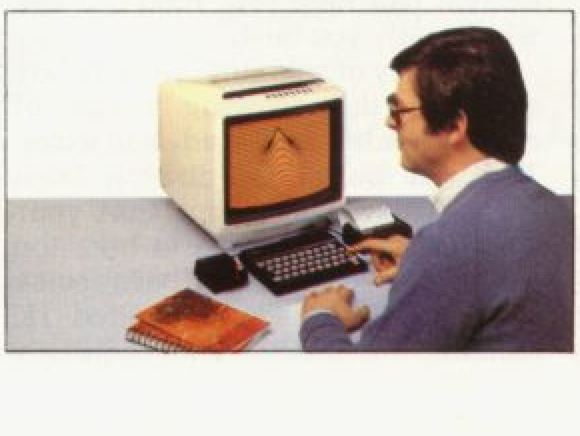
You may decide to begin with the 16K version. If so, you can still return it later for an upgrade. The cost? Around £60.

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There's no need to stop there. The ZX Printer–available now– is fully compatible with the ZX Spectrum. And later this year there will be Microdrives for massive amounts of extra on-line storage, plus an RS232 / network interface board.



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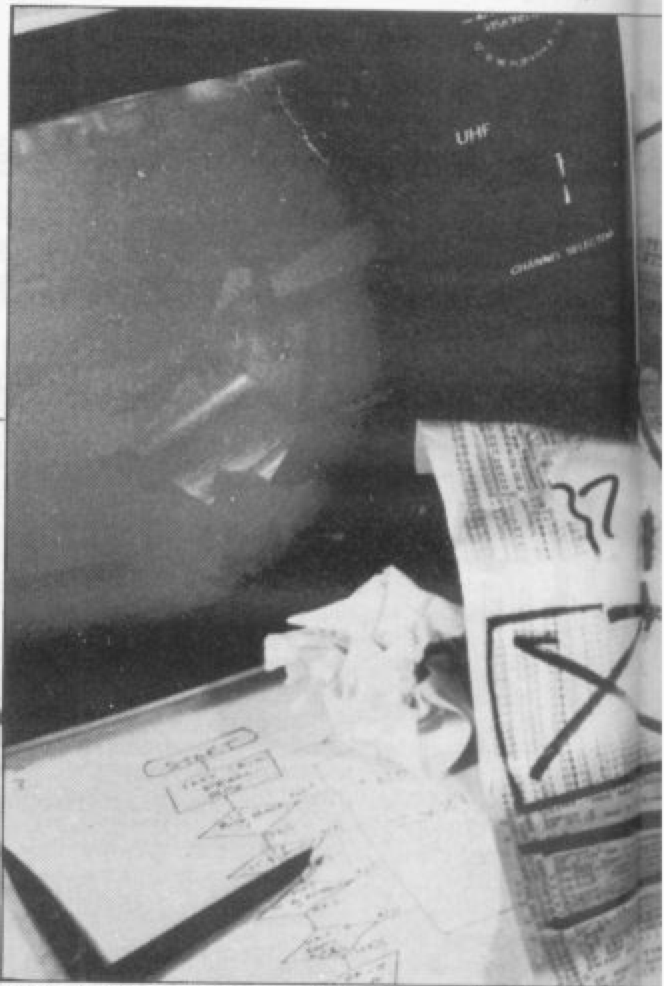
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Writing your own programs helps boost the enjoyment of your machines. In this first of a series John Gilbert shows how best to start

Following the flow to better programs

MANY PROGRAMS written by beginners to computing show a lack of what professionals call structure. The structure of a program is the way in which it is put together and the order in which the code — the language in which it is written — is put down in the finished product.

This series will show the beginner how to structure programs so that they will work faster and occupy less memory. As an example of how the techniques work, a database will be constructed in the articles which can be used to store lists of information, such as names and addresses or telephone numbers. The information stored in the database can be called back by typing-in a keyword which corresponds to the information sought by the user.

Before we start to do any coding it is important to know about flowcharting. A flowchart, such as the one in figure one, is constructed before coding to act as a guide to what the finished program will look like. If it is written after coding has been completed and before the programmer starts to search for errors — to debug the program — it will be an aid in finding redundant code or code which inhibits the flow of a program.

The program flow is the way in which the program will be executed. It is important to have that correct or errors will continue to occur in the program and the speed of the program will be slower.

The basic flowcharting symbols are the Input/Output box, operation rectangle and decision diamond and an example of each is shown in figure one.

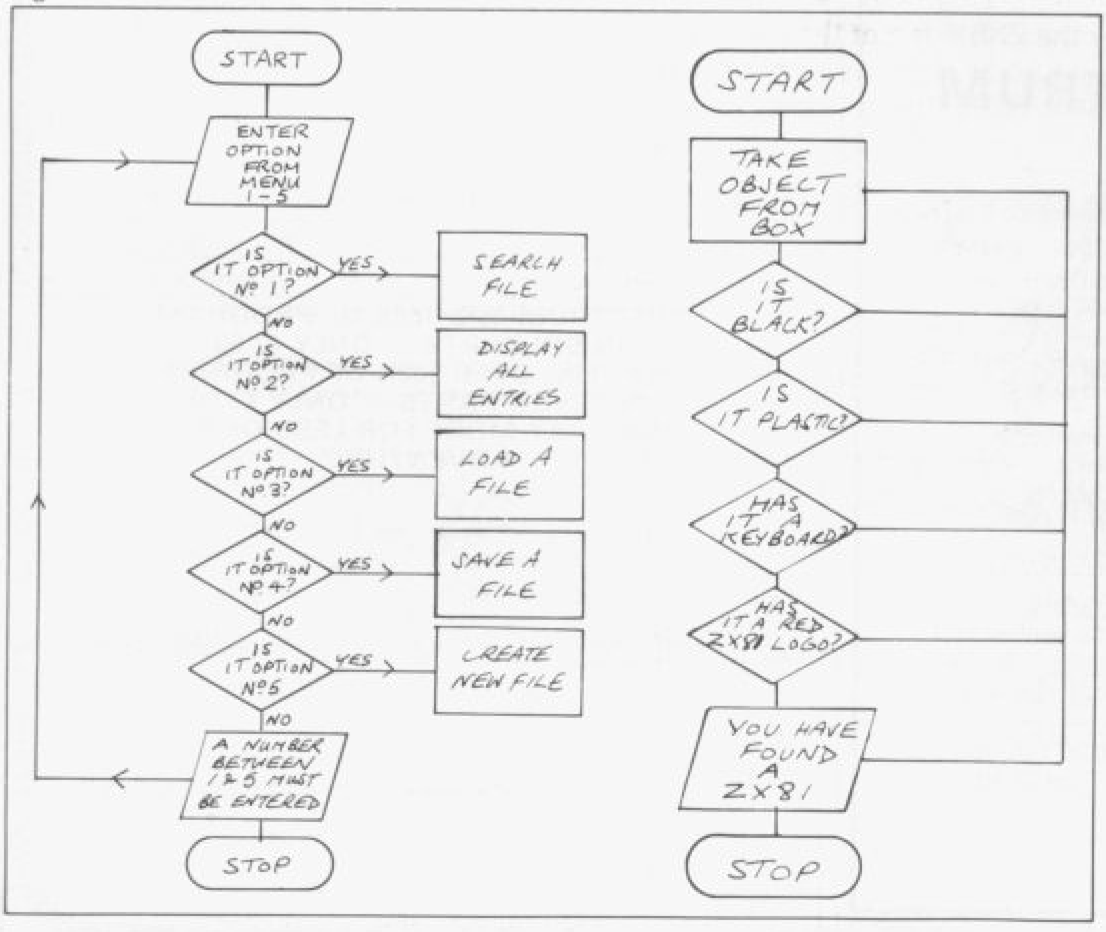
The I/O box is used to mark places where an entry is made by the computer operator, or when the computer displays data on a screen or printer. The box can be used for all forms of input, including keyboard, joystick, or even punched cards on a large mainframe computer.

When debugging a program, checks for errors should first be made at those junctions in the flowchart, as the boxes mark places where a user can crash a program by entering the incorrect information.

The decision diamond is the most complex operation box in a computer flowchart — and the most necessary. A computer is distinguished from other machines through its ability to make decisions based on information. Usually the processing of that information will provide a simple yes or no answer. The inflow to the diamond descends vertically and splits in two to provide the yes/no options.

The option which contradicts the program flow goes out to the side of the box and can be directed up, to form a loop until the action has been performed correctly, or down if alternative action is required to that

Figures 1 and 2





down through all the GOSUBs but jump only to those specified by the user through the menu.

The database will function using a keyboard recognition function. The user enters a few words which act as a key phrase. The program will then look through the list, or file, of information in the program and, if a match is made between the key phrase and part of a piece of information, that piece of information will be output. The computer will output all information which is associated with the key phrase.

The program will also have to support separate data files and be user-friendly so that anyone can use it. The program menu will have search files, display entries, load or save files, and create new files. The program structure will look like this from top to bottom, with the control routine at the top.

The complete flowchart of the database is shown in figure one. Using that chart it will be easy to translate each operation into program code.

Next month I will show how the overall structure of the program is finalised and we can start coding.

of the normal flow. Finally, the operation rectangle is used to show that the computer has to perform some kind of calculation. That may be adding numbers, assigning numbers to variables, or scanning a string of characters. The use of that and the other boxes is illustrated in figure one.

Flowcharts usually are constructed before writing a program but it is a good idea to draw up one from the finished program to see if the program flows as it was originally intended.

When drawing a chart the boxes should be balanced as much as possible to the left and right of the main stem of the flow. The whole point of flowcharting is to create an easily-understood diagram. The labels inside the symbols should be written in English and not in Basic.

The diagram in figure one uses several decision diamonds and they branch to both left and right. A flow on just one side of the diagram looks sloppy if there are more than two decisions to be made.

The way not to structure a flowchart is shown in figure two. The flow lines at the side have been run together, making it almost impossible to decide what happens next. That is remedied easily by making the chart longer and restructuring the lines into separate boxes as shown in figure three.

When writing a program it is a good idea to draw several flow diagrams. The first would be an overall plan showing the sections of program to be written and subsequent diagrams would expand each box to show the flow of the various routines.

A program is structured in a similar way to a flowchart. Most programs are constructed in the way figure one shows. The technique is called modular programming because the structure is broken into subroutines, or sections, called modules.

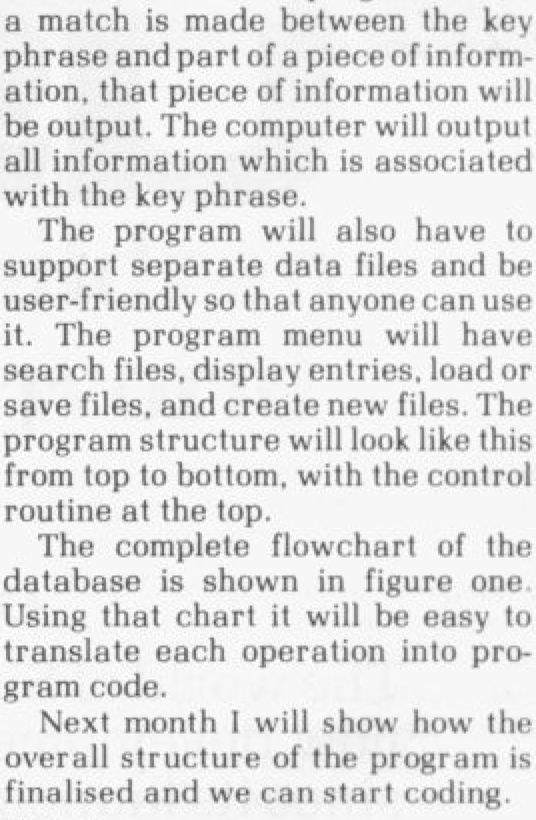
The reason is to eliminate as many GOTO statements as possible, or to make a GOTO statement jump only to a part of the routine in which it is situated, i.e., to make what is termed a local jump, or the control routine at the top of the program.

The control routine consists of a series of GOSUBs. It is the part of the program which is used most, so it is the first thing that the computer encounters when scanning the program. In that way the program is faster in execution, so it becomes more efficient.

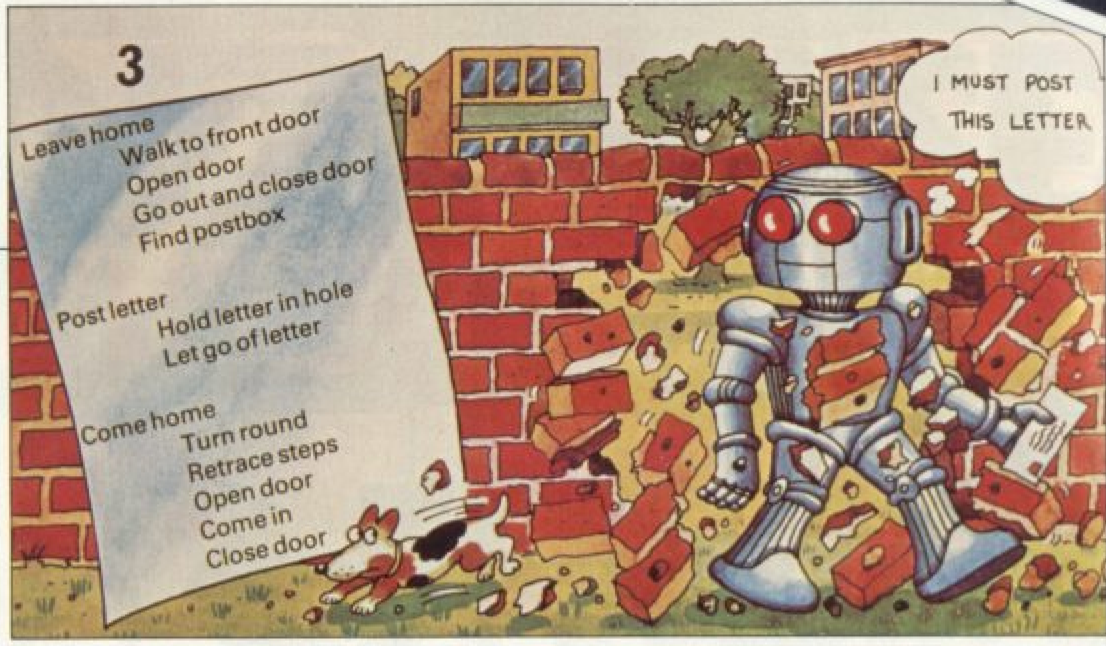
A control routine can have two distinct structures. The first is used in a game-type program. That type of program will execute routines by going down through each of the GOSUBs in turn and then returning to the beginning.

The other type of structure is that which we shall use for the database. The program will first jump to the menu routine where the user will select an option. Control is then sent back to the control routine and, using a series of IF. . ., THEN statements, the program will go to the subroutine selected by the player. The control program will not go

Figure 3







A detail from Introduction To Computer Programming, *one of the Usborne Electronics range of books*

John Gilbert on the growing bookshelf

Leading children into micro world

THE emphasis in the Sinclair book market is now on teaching young people about the uses of modern technology, and computers in particular. Usbourne Publishing Ltd has just produced a series of four books on micro-computers.

Two of them consist of listings of programs for various micro-computers, including the Spectrum and ZX-81. There is usually only one listing of each program but symbols at the side refer the reader to conversion notes for their computers.

The two, *Computer Space Games* and *Computer Battle Games*, are full of colourful drawings which will appeal to young children. The books cost £1.99 each and are a good idea, for they will coax children into work with computers, something with which some adults still seem to have difficulty. The function of the books is to catch the interest of the young so that they have no difficulties copies with technology in later life.

The other two books in the Usbourne range are *Introduction to Computer Programming* and *Understanding the Micro*. Both explain their subjects, using diagrams and colour drawings as an aid to understanding. Each costs £1.65. The range will be available from most bookshops, including W H Smith.

The ZX-81 is still featuring strongly in the Sinclair publishing market. Following *The Art of Programming the 1K ZX-81*, Babani Publishing has *The Art of Programming the 16K ZX-81*. The book provides one of the most comprehensive introductions to the ZX-81 available. It takes the reader through the possible uses of the expanded machine and then explains advanced subjects such as machine code and programming techniques. It even includes a chapter on advanced randomness with methods of selecting random numbers using Chi squares, poission and binomial distribution.

'The quality has improved but is still mainly listings'

Chapters include graphics, designing programs, games and programming techniques. It costs £2.50.

Ivor Killerbyte is obviously a pseudonym but the man who has produced *Write Efficient ZX-81 Basic* does not use the name because he does not want to be associated with the book. The book is very informative and well worth £5.95. It starts with the premise that the reader has a 1K machine and some of the things Killerbyte manages to squeeze from it are amazing.

Included is a series of programs, such as full screen pattern generators, a giant character maker and some interesting graphics games. Killerbyte also provides a series of 36 rules of programming, spread through the book. They include using REM statements to describe programs where possible and making programs as user-friendly as possible. The book is published privately.

Several books concerning the Spectrum appear every week. Even Clive Sinclair has extended into the market with the *Sinclair Computer Guides*. He has written the foreword to the first guide, which was written by Tim Hartnell.

The ZX Spectrum Explored covers a large range of areas of Spectrum usage. There are chapters on the use of the computer in business and education, as well as games. There is also a short tour of the three-dimensional graphics capabilities of the Spectrum and a 10-page introduction to machine code. The techniques explained are illustrated with program listings, including a diary program and database.

It costs £5.95 and is available from Sinclair Browne.

The quality of books about Sinclair computers has improved but authors still seem to concentrate games program listings and books on Sinclair Basic. Many areas, such as machine code and programming techniques, could be better-explored.

Usbourne Publishing, 20 Garrick Street, London WC2E 9BJ.

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Looking at using the teaching micro

Eric Deeson reveals his thoughts on how Sinclair can help in schools

THE EDUCATIONAL ZX Users' Group Spot ... doesn't that sound good? I believe that we can start thinking that the educational uses of ZX micros have arrived when the field merits regular space in these pages.

Before you all start turning hastily to the advertisements or the kill-for-joy games listings, I think I should emphasise a few points. Educational computing may seem to be a minority interest but it is my task to prove otherwise. This column is not directed only to teachers, though I hope that if you are a teacher you will not need convincing that you should read it.

The EZUG Spot is intended to provide items of interest for all. It replaces the EZUG *Newsletter* which seemed to fill a need for many folk outside education — teachers, parents, students and pupils, and even people with no significant contact with education; all were important classes of subscribers.

The *Newsletter* used to provide tips. Such as this one from Ian Logan, for long a much-appreciated supporter of the group:

PRINT 65536 — USR 7962

to find memory available.

Logan reckons that the original Spectrum ROMmer had expected a key, called FRE perhaps, for that useful function.

The *Newsletter* used to plead for tips. Here are two so far unanswered queries:

- How can you get the Spectrum to drive a video monitor?
- Can anyone supply diagram of, or reference to, a circuit giving key repeat for the ZX-81 as on Spectrum? A number of add-on manufacturers offer one.

The *Newsletter* also provided reviews of relevant — i.e., innovative and fairly serious books, hardware and software. Like these:

Machine code and better Basic by Ian Stewart and Robin Jones, Shiva, 188pp, £7.95. Review by Keith Jammer. Many thousands of teachers found its predecessor, *PEEK, Poke, Byte and RAM*, an outstanding introduction to Sinclair programming for themselves and for youngsters. If you are among them, I need say only that this continues in the same vein.

If you were not, I urge you to join the throng to the bookshops. As *Peek, Poke* ... was the most inspiring introduction to beginning with the 1K ZX-81, this is bound to become the most inspiring course on advanced programming with the 16K version — and, of course, the Spectrum.

> 'The column is not directed only at teachers, though I hope they will not need convincing that they should read it'

The text is tight-packed and readable and very well illustrated; it deals with structured programming, data structures and machine coding. As a bonus you get thoughtfully-developed listings of a text editor, a queueing simulator and a vocabulary testing game. If you base your A level teaching on Sinclairs, add this to your course texts; but at whatever level of work, you will find that you and your pupils will gain enormously from it.

Crofton Keyboard (ZX-81 Adaptakit). Review by David Green. This unit, like others of its kind, is available either as a kit or ready-built. The ZX circuit board is screwed inside. My model had no ribbon cable for connections and two dry joints gave me a little trouble. The keyboard has a video monitor amplifier on board but the leads from the Crofton board to the Sinclair PCB are pitifully short and rather fussy to solder.

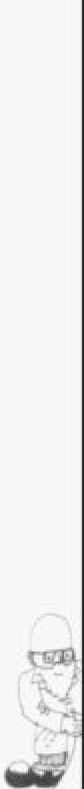
A ribbon cable connector with plug-in contacts would have been much better for the keyboard and not everyone will feel a monitor output is necessary and might prefer a REPEAT on the keys. The model I have was "built" — the keyswitches were soldered to the PCB — but it arrived with all the key-tops loose in the package, and no spares.

The edge connector is satisfactory for the RAM but a little tight for the printer. All the keys are flat, unlike a conventional keyboard, but the duplication of many keys, such as SHIFT — one on each side — PRINT and " makes typing much easier. NEWLINE is twice the length of a conventional key but, being supported at one end only, tends to 'bend'.

The SPACE BAR is about four keys long and supported by two keyswitches; it is rather stiff. When originally assembled, some of the keyswitches were too close to each other but this can be eased gently.

The overall design is very pleasing and matches the RAM and printer. The key layout is very good but one spare key for REPEAT or RESET would have been useful. I am very pleased with the unit and the adverse comments need to be set

continued on page 46







continued from page 45
against the overall advantages and appearance of the kit.

- The video monitor output gets in the way of the all-too-short printer lead.
- The internal connections should have been — perhaps they are now — by ribbon cable and plug, rather than having to solder to the Sinclair board.
- The internal monitor connection leads are cramped together and far too short.
- The well-designed case can be a little distorted and the self-tapping screws are not easy to secure.

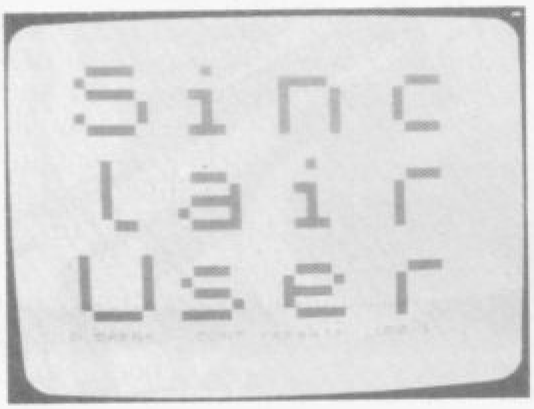


Figure 1.

This unit has now been in regular use for some weeks, by myself and by a multitude of children. The advantages common to all "standard" keyboards are obvious and the absence of "pitch" on the keys is no disadvantage. The NEWLINE key is easier to see but also easier to displace and a full-length space bar might have been better.

No assessment of such a standard unit as the Crofton 9in. monitor is really necessary but in our local education authority portable TVs are frowned on and the Crofton monitor claims to meet educational safety standards.

In use, driven by the Crofton keyboard, the resolution is excellent, but you have to become accustomed to a slower return of display from FAST mode and to unusual patterns before LOADing patterns appear.

With the Crofton ZX Adaptakit you have a very smart micro. In my situation I use the monitor as standard but often drive a TV as well, so that the children can watch. The price for these items is £100 exclusive of VAT.

The Educational ZX Users' Group was set up by MUSE, Britain's biggest professional association for educational computing. That was two-and-a-half years ago, soon after the ZX-80 changed our lives. The main aim of EZUG was, and remains, the development of a good ZX educational software library. We have done well there, with more than 50 ZX-81 programs and already more than a quarter as many for Spectrum.

The programs are available in Britain to MUSE members only and therefore will not be mentioned a great deal in this column. You can obtain a list by sending me two 12½ pence stamps.

The *Newsletter*, which has ceased publication after 12 bimonthly issues, reached thousands of people in more than 40 countries.

I would like to deal with a short routine, set as a complete program, which should much improve the value of the Spectrum in the classroom. It displays on screen in jumbo size characters — three lines of four — any required 12-character string, as illustrated in figure one. The routine in figure two digs up the ROM data for each ASCII character and follows the same pattern, character block for pixel.

The strings for display are held in DATA statements and be 12 characters. Press ENTER at the end of the first and second lines to start the next line coming but do not press it at the end of the third until you want the next string along.

It is not difficult to add colour and sound if you wish to use some other block instead of inverse black, to halve the magnification factor, and/or to provide automatic scrolling of a much longer message.

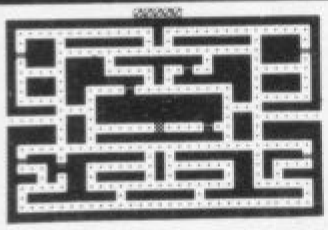
EZUG: Highgate School, Birmingham 12 — send two second-class stamps for details of ZX educational software.
MUSE: Freepost, Bromsgrove, Worcestershire — for information about the benefits of membership of the EZUG parent organisation.
Microscene: 6 Battenhall Road, Birmingham 17 — £2.50 for the *Guide to Spectrum Resources*.

Figure 2.

```
  10 DIM a(4): DIM b(8)
  20 FOR c=1 TO 8
  30    LET b(c)=2↑(c-1)
  40 NEXT c
  50 READ a$
  60 FOR h=0 TO 2
  70    FOR d=1 TO 4
  80       LET a(d)=CODE a$(d+h*4)-32
  90    NEXT d
 100    FOR e=0 TO 7
 110       FOR d=1 TO 4
 120          LET f=PEEK (15616+8*a(d)+e)
 130          FOR c=1 TO 8
 140             LET g=1-(f<b(9-c))
 150             PRINT (" " AND NOT g)+("█" AND g);
 160             LET f=f-g*b(9-c)
 170          NEXT c
 180       NEXT d
 190    NEXT e
 200    PAUSE 0
 205 IF h THEN POKE 23692,2
 210 NEXT h
 220 CLS : GO TO 50
 230 DATA "Pooh to BBC!"
 240 DATA "  23+142=165"
 250 DATA "etc etc etc "
```

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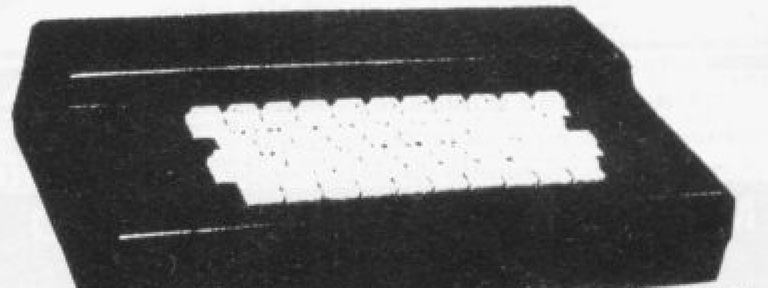
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Dave Sayers reviews some of the growing number of cassettes for older pupils

Sinclair route to better O levels

AS MORE and more people get to know the ZX-81 and its possibilities an increasing number of software suppliers are producing cassettes on subjects other than games.

One major growth area has been education. In September we published a round-up of most of the programs which were then available. The market has continued to grow and we have decided to look again at what is an offer.

Cassettes are available for children of all ages, from nursery school to GCE O level. In the upper age range we looked at programs from Scisoft, Calpac and Rose Cassettes.

Scisoft of 8 Minster Gardens, Newthorpe, Eastwood, Nottingham, NG16 2AT, produces cassettes for O level chemistry, biology and physics. The subjects covered in chemistry are titrations, masses, molarity, mystery metal, electrolysis, the gas equation and mystery gas; in biology are enzymes, hormones, botanical terms, alimentary canal, bodily organs; and in physics, gas laws, linear expansion, moments, electricity equations and Snell's Law.

Each cassette is accompanied by a comprehensive booklet of revision notes, packed with drawings and information. They were a big plus in favour of the programs and would certainly be most useful. The programs are recorded on high-quality cassette and all loaded first time.

> 'Overall, the Scisoft programs represent some of the best educational software so far seen and are recommended for use'

The 'unknown' section of the biology tape contains some bugs, bad enough to stop the program and too numerous to alter, not that it should be necessary. The rest of the programs ran so well, though, that it was clear the bugs were the exception rather than the rule.

The material covered was good, with useful instructions and tips. Some of the graphics in the chemistry program enlivened what can often be a dull slog of repetitious learning and the randomised questions in the programs required a sound knowledge of the subject.

Suggestions of the degree of success are given at the end of each tape. Overall, the programs represent some of the best educational software so far seen and are recommended for use, either at home or in the school, and are good value at £7.50 each.

The Calpac O level chemistry sent for review is a single cassette with no accompanying literature. There are four programs on the cassette, dealing with elements, compounds, mixtures, activity series, acids, bases and salts.

Each program has only 10 questions and there is no random element. Well-presented and easy to load and use, they were, however, more limited than the Scisoft versions but they could still be useful for drilling. The cassette costs £5.50 and is available from 108 Hermitage Woods Crescent, St Johns, Working, Surrey GU21 1UF.

Rose Cassettes 148 Widney Lane, Solihull, West Midlands B9I 3LH sent O level maths revision and O level French. The French cassette has six programs, three dealing with grammar and three with vocabulary. The maths cassette has one revision program and two test programs using questions from the O level syllabus.

In classroom use children have been using other Rose programs consistently with no problems at all and so it is safe to recommend these two as useful classroom aids. The cassettes cost £4.50 each and there are no accompanying booklets.

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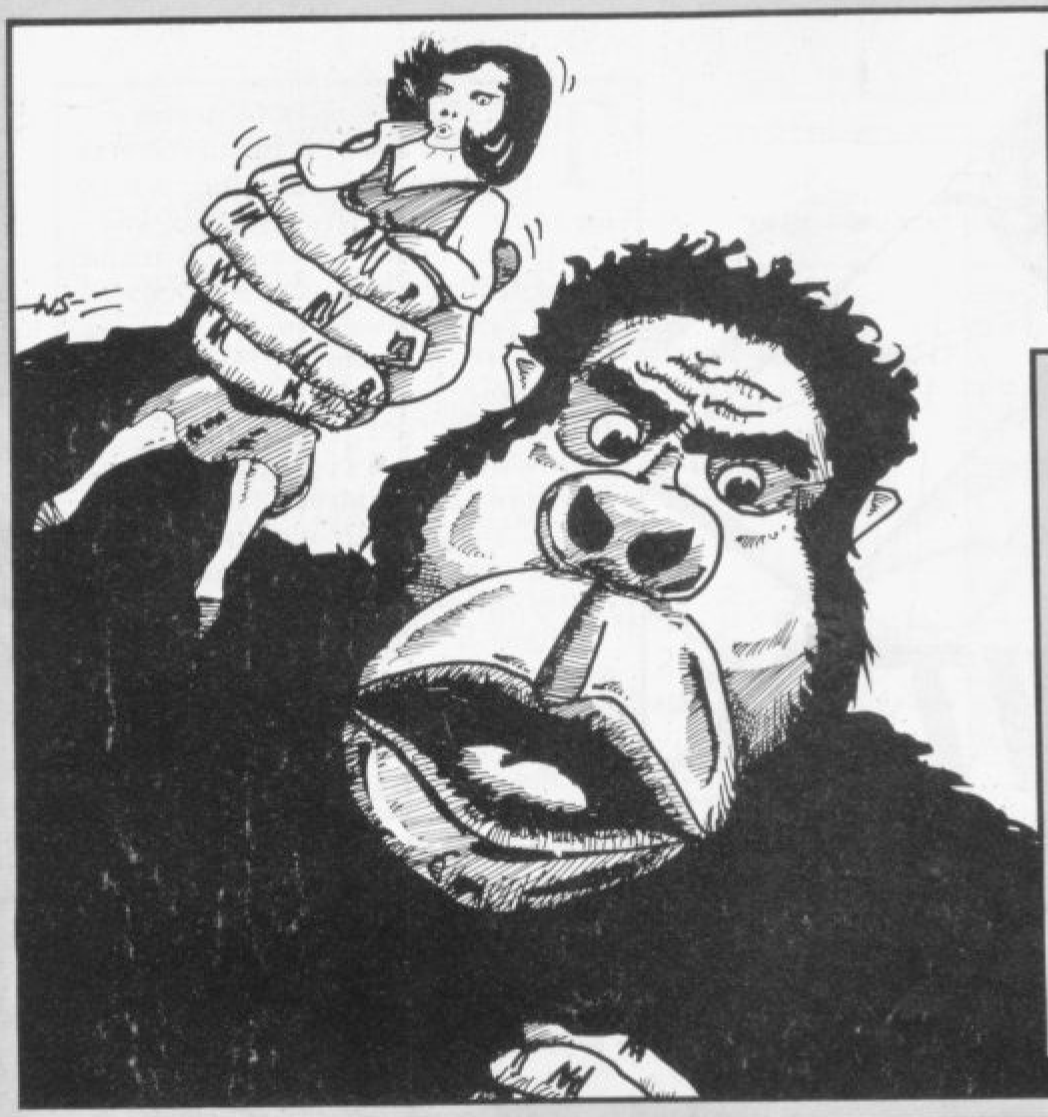
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PROGRAM PRINTOUT



KONG

KONG is a 1K ZX-81 version of the popular arcade game, Donkey Kong. The idea is to leap over all the objects put before you in the game. That could include jumping over logs or jumping holes.

If you do not jump and land in a hole the game will finish with error code 2. The logs start rolling from the right of the screen and you must use the magic keys — shifted 6 or 7 — to jump the obstacles. Shifted 8 will also allow you to jump right but keys 8 and 5 will allow you only to move horizontally right and left respectively.

The program was sent by Nicholas Sheard of Prestbury, Cheshire.

```
  10 LET A=1
  20 LET B=A
  30 LET C=26
  40 LET S=PI-PI
  50 LET K=C
  60 LET L=A
  70 LET N=L+L
  80 LET P=C
  85 LET T=L-L
  90 PRINT AT PI,T;"5 INVERSE SP
ACES,SPACE,5 INVERSE SPACES,SPAC
E,3 INVERSE SPACES,SPACE,2 INVER
SE SPACES,SPACE,3 INVERSE SPACE,
SPACE,4 INVERSE SPACES"
 100 PRINT AT N,K;"H";AT N,C;"OO
O";AT A,B;"O";TAB B;"L";AT A+N,B
;
 110 LET E=PEEK (PEEK 16398+256*
PEEK 16399)
 120 IF A=L AND B=C OR A=L AND B
=C+N OR A=L AND B=C+N+N OR A>=N
THEN PRINT S;H
 130 IF E<>128 THEN LET A=A+L
 140 LET S=S+(E=P+P)+P*(E=45)
 150 IF E=45 THEN GOTO 300
 200 LET C=C-1
 210 IF C=T THEN LET C=P
 220 LET B=B+(INKEY$="8" OR INKE
Y$=CHR$ 115)-(INKEY$="5" OR INKE
Y$=CHR$ 114)
 230 IF E=128 AND INKEY$>=CHR$ 1
12 THEN LET A=A-L
 280 PRINT AT N,T;"        ";AT T,
B-L;"    ";TAB B-L;"    ";TAB B-L;
"    "
 290 GOTO 100
 300 LET K=K+((P-L)*(K=L))-((P-L
)*(K=P))
 320 GOTO 90
```



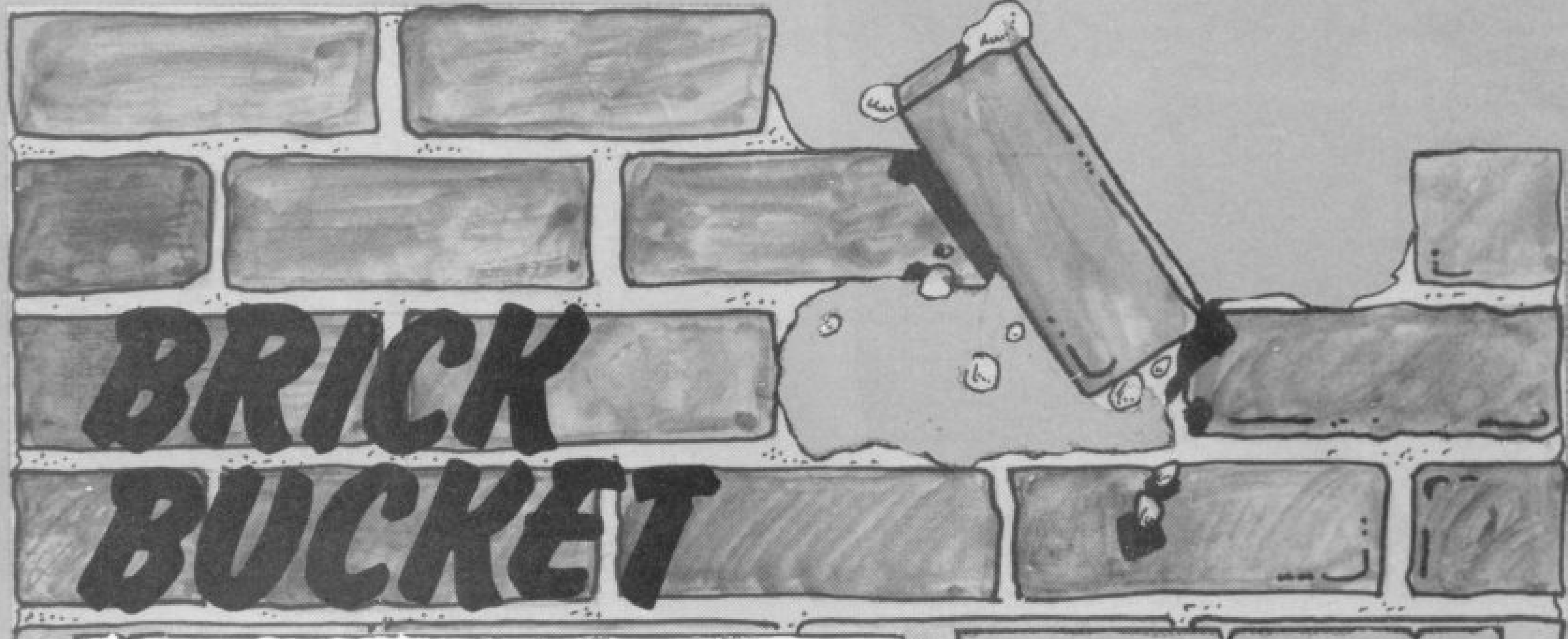
HOT PURSUIT

THE OBJECT of **Hot Pursuit** for the 16K ZX-81 is to pursue and capture the moving white square using the cursor-key-controlled cross. The game is made more difficult because the block will do its best to avoid your crusading cross. It will jump to the opposite side of the screen if you force it on to the black border.

The author, S N Yogasudram of Preston, Lancashire, says that the skilful player can manipulate the block so that it is forced to materialise on top of the cross.

There is a timing system which governs the number of points awarded at the end of the game. The more time taken to trap the square the fewer points are awarded.

```
 100 FAST
 300 FOR N=0 TO 31
 310 PRINT AT 21,N;"inverse SPAC
E";AT 0,N;"inverse SPACE"
 315 NEXT N
 320 FOR N=0 TO 20
 330 PRINT AT N,0;"inverse SPACE
";AT N,31;"inverse SPACE"
 340 NEXT N
 690 SLOW
 695 LET X=18
 698 LET Y=29
 710 LET M=1
 720 LET N=1
 730 LET S=0
 740 PRINT AT M,N;"+"
 750 FOR T=100 TO 2 STEP -1
 760 PRINT AT X,Y;"graphic H"
 800 IF M=X AND N=Y THEN GOTO 30
00
2000 PRINT AT M,N;" "
2020 IF INKEY$="5" THEN LET N=N-
2040 IF INKEY$="6" THEN LET M=M+
1
2060 IF INKEY$="7" THEN LET M=M-
1
2080 IF INKEY$="8" THEN LET N=N+
1
2090 PRINT AT M,N;
2100 IF PEEK (PEEK 16398+256*PEE
K 16399)=128 THEN GOTO 3040
2120 PRINT AT M,N;"+"
2140 IF M=X AND N=Y THEN GOTO 30
00
2200 LET R=RND
2210 LET DX=0
2240 IF R<=.1 THEN LET DX=1
2280 IF R>=.4 THEN LET DX=-1
2285 IF N=Y THEN LET DX=SGN (X-M
)
2290 LET Z=RND
2300 LET DY=0
2310 IF Z<=.1 THEN LET DY=1
2320 IF Z>=.4 THEN LET DY=-1
2330 IF X=M THEN LET DY=SGN (Y-N
)
2340 PRINT AT X,Y;" "
2400 LET X=X+DX
2420 LET Y=Y+DY
2440 PRINT AT X,Y;
2460 IF PEEK (PEEK 16398+256*PEE
K 16399)=128 THEN GOTO 2480
2470 NEXT T
2480 IF X=0 THEN LET X=20
2490 IF X=21 THEN LET X=1
2500 IF Y=0 THEN LET Y=30
2520 IF Y=31 THEN LET Y=1
2540 NEXT T
3000 PRINT AT M,N;"inverse ASTER
ISK"
3020 LET S=10*T
3040 PRINT AT 21,2;"SCORE ";S;"
POINTS"
```



BRICK BUCKET

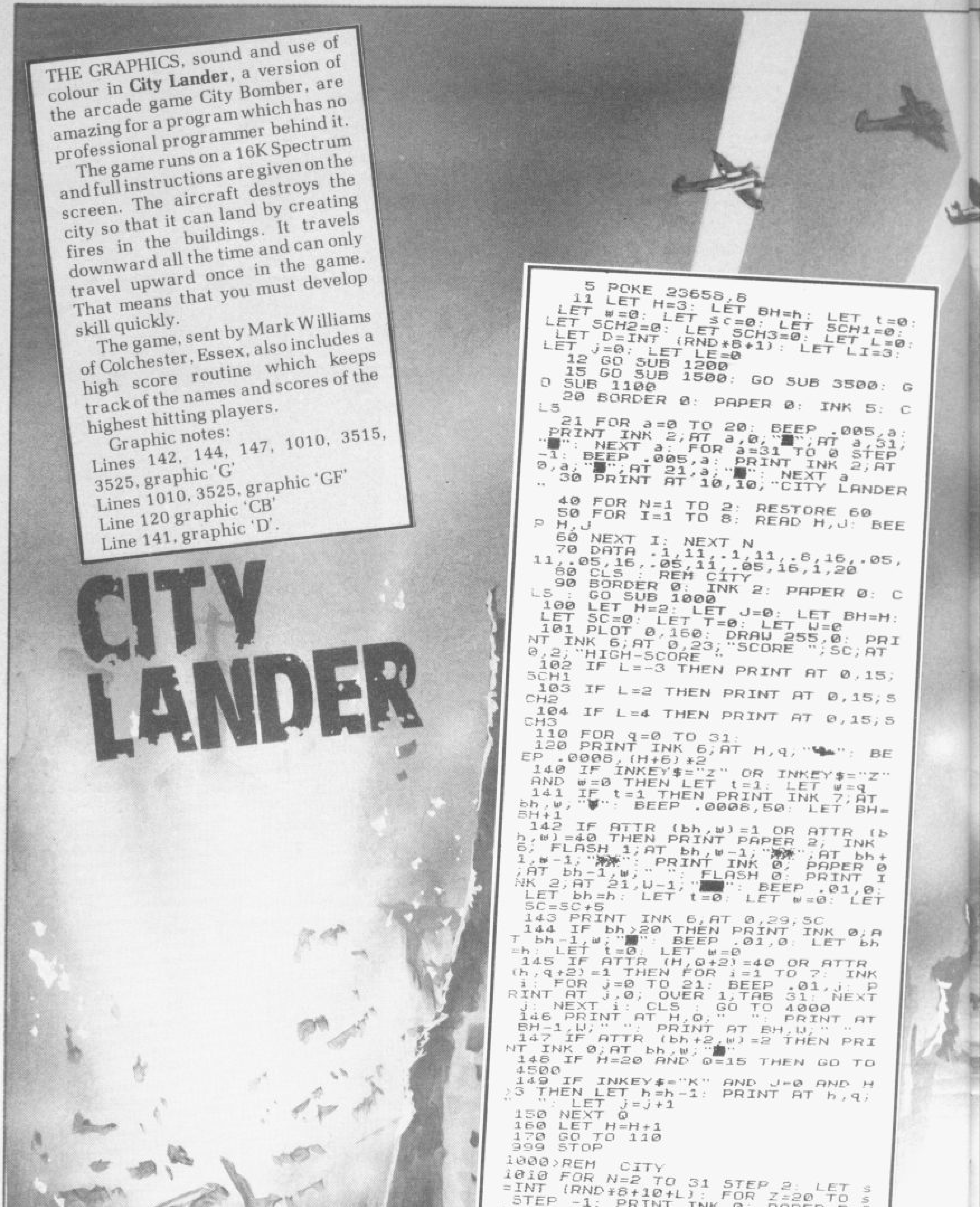
```
1010 GO SUB 6000
1020 BORDER 5: PAPER 5: INK 0: C
LS
1030 LET d=5: LET A$="▙▁▟"
1040 LET p=14: LET score=0
1050 PRINT AT 21,p;A$
1060 PRINT AT 0,0; PAPER 6;" SCO
RE   ";AT 0,22;" BRICKS     ";
2000 REM DROP BRICKS
2010 FOR a=1 TO 10
2020 PRINT PAPER 6;AT 0,30;a
2030 FOR n=0 TO 20: BEEP .02,n:
NEXT n: PAUSE 100
2040 LET c=INT (RND*29)+1
2050 FOR b=1 TO 20
2060 PRINT AT b,c; INK 2;"▬"
2070 IF INKEY$="1" AND p>0 THEN
GO SUB 4000
2080 BEEP d/100,b
2090 IF INKEY$="0" AND p<29 THEN
 GO SUB 5000
2100 PRINT AT b,c;" "
2110 NEXT b
2120 IF c=p+1 THEN LET score=sco
re+1: FOR n=60 TO 0 STEP -1: BEE
P .01,n: NEXT n
2130 PRINT PAPER 6;AT 0,7;score
2140 NEXT a
3000 REM NEXT ROUND
3010 IF score<5 THEN LET d=d+1:
CLS : GO TO 1040
3020 IF score=10 AND d=1 THEN GO
 TO 3050
3030 IF score>5 AND d>1 THEN LET
 d=d-1
3040 CLS : GO TO 1040
3050 BORDER 0: PAPER 0: CLS
3060 PRINT AT 5,5; BRIGHT 1; FLA
SH 1; PAPER 2; INK 6;"WELL DONE.
 TOP SCORE.": STOP
4000 REM MOVE LEFT
4010 PRINT AT 21,p;"     "
4020 LET p=p-1
4030 PRINT AT 21,p;A$
4040 RETURN
5000 REM MOVE RIGHT
5010 PRINT AT 21,p;"     "
5020 LET p=p+1
5030 PRINT AT 21,p;A$
5040 RETURN
6000 REM BUCKET
6010 FOR n=0 TO 7: READ l: POKE
USR "▙"+n,l: NEXT n
6020 FOR n=0 TO 7: READ m: POKE
USR "▁"+n,m: NEXT n
6030 FOR n=0 TO 7: READ r: POKE
USR "▟"+n,r: NEXT n
6040 DATA 192,192,192,192,192,19
2,255,255,0,0,0,0,0,0,255,255,3,
3,3,3,3,3,255,255
6950 RETURN
```

BRICK BUCKET for the 16K Spectrum has the gamer catching red bricks in a bucket. You can move the bucket by pressing '1' to move left and 'O' to move right. The score and number of bricks to have fallen is printed at the top of the screen. You must catch more than five bricks to reach the next level of the game, where the bricks fall faster until you catch 10 bricks at high speed.

If you catch five bricks on the first leg, you will go again at the same speed. If you catch fewer than five the speed of the bricks will drop until you have gained more experience of the game. Graphics notes:
Line 1030, graphic ABC
Line 2060 inverse graphic '3'.

The game was sent by Ken Rylett of Burnage, Manchester.





THE GRAPHICS, sound and use of colour in **City Lander**, a version of the arcade game City Bomber, are amazing for a program which has no professional programmer behind it.

The game runs on a 16K Spectrum and full instructions are given on the screen. The aircraft destroys the city so that it can land by creating fires in the buildings. It travels downward all the time and can only travel upward once in the game. That means that you must develop skill quickly.

The game, sent by Mark Williams of Colchester, Essex, also includes a high score routine which keeps track of the names and scores of the highest hitting players.

Graphic notes:
Lines 142, 144, 147, 1010, 3515, 3525, graphic 'G'
Lines 1010, 3525, graphic 'GF'
Line 120 graphic 'CB'
Line 141, graphic 'D'.

CITY LANDER

```
   5 POKE 23658,8
  11 LET H=3: LET BH=h: LET t=0:
 LET w=0: LET sc=0: LET SCH1=0:
LET SCH2=0: LET SCH3=0: LET L=0:
 LET D=INT (RND*8+1): LET LI=3:
LET j=0: LET LE=0
  12 GO SUB 1200
  15 GO SUB 1500: GO SUB 3500: G
O SUB 1100
  20 BORDER 0: PAPER 0: INK 5: C
LS
  21 FOR a=0 TO 20: BEEP .005,a:
 PRINT INK 2;AT a,0;"■";AT a,31;
"■": NEXT a: FOR a=31 TO 0 STEP
-1: BEEP .005,a: PRINT INK 2;AT
0,a;"■";AT 21,a;"■": NEXT a
  30 PRINT AT 10,10;"CITY LANDER
"
  40 FOR N=1 TO 2: RESTORE 60
  50 FOR I=1 TO 8: READ H,J: BEE
P H,J
  60 NEXT I: NEXT N
  70 DATA .1,11,.1,11,.8,16,.05,
11,.05,16,.05,11,.05,16,1,20
  80 CLS : REM CITY
  90 BORDER 0: INK 2: PAPER 0: C
LS : GO SUB 1000
 100 LET H=2: LET J=0: LET BH=H:
 LET SC=0: LET T=0: LET W=0
 101 PLOT 0,160: DRAW 255,0: PRI
NT INK 6;AT 0,23;"SCORE ";SC;AT
0,2;"HIGH-SCORE "
 102 IF L=-3 THEN PRINT AT 0,15;
SCH1
 103 IF L=2 THEN PRINT AT 0,15;S
CH2
 104 IF L=4 THEN PRINT AT 0,15;S
CH3
 110 FOR q=0 TO 31:
 120 PRINT INK 6;AT H,q;"▲": BE
EP .0008,(H+6)*2
 140 IF INKEY$="z" OR INKEY$="Z"
 AND w=0 THEN LET t=1: LET w=q
 141 IF t=1 THEN PRINT INK 7;AT
bh,w;"▼": BEEP .0008,50: LET BH=
BH+1
 142 IF ATTR (bh,w)=1 OR ATTR (b
h,w)=40 THEN PRINT PAPER 2; INK
6; FLASH 1;AT bh,w-1;"✱✱";AT bh+
1,w-1;"✱✱": PRINT INK 0; PAPER 0
;AT bh-1,w;" ": FLASH 0: PRINT I
NK 2;AT 21,W-1;"■■": BEEP .01,0:
 LET bh=h: LET t=0: LET w=0: LET
 SC=SC+5
 143 PRINT INK 6,AT 0,29;SC
 144 IF bh>20 THEN PRINT INK 0;A
T bh-1,w;"■": BEEP .01,0: LET bh
=h: LET t=0: LET w=0
 145 IF ATTR (H,Q+2)=40 OR ATTR
(h,q+2)=1 THEN FOR i=1 TO 7: INK
 i: FOR j=0 TO 21: BEEP .01,j: P
RINT AT j,0; OVER 1,TAB 31: NEXT
 j: NEXT i: CLS : GO TO 4000
 146 PRINT AT H,Q;" ": PRINT AT
BH-1,W;" ": PRINT AT BH,W;" "
 147 IF ATTR (bh+2,w)=2 THEN PRI
NT INK 0;AT bh,w;"■"
 148 IF H=20 AND Q=15 THEN GO TO
 4500
 149 IF INKEY$="K" AND J=0 AND H
>3 THEN LET h=h-1: PRINT AT h,q;
" ": LET j=j+1
 150 NEXT Q
 160 LET H=H+1
 170 GO TO 110
 999 STOP
1000>REM CITY
1010 FOR N=2 TO 31 STEP 2: LET s
=INT (RND*8+10+L): FOR Z=20 TO s
 STEP -1: PRINT INK 0; PAPER 5;A
T Z,N;"■";AT Z,N+1;"■": PRINT IN
```



```
K 1;AT s-1,n;"▲": NEXT Z: NEXT
N: FOR z=0 TO 31: PRINT INK 2;AT
 21,z;"█": NEXT z
1015 INK 7
1020 RETURN
1100 PAPER 0: INK 4: BORDER 0: C
LS : LET D=2: LET AL=6: LET A$="
TODAYS GREATESTS"
1110 FOR A=1 TO LEN A$
1120 PRINT AT D,AL+A;A$(A TO A)
1125 BEEP .01,30
1130 NEXT A
1135 IF LEN A$=10 THEN GO TO 115
0
1136 IF LEN A$=11 THEN GO TO 116
0
1137 IF LEN A$=12 THEN GO TO 117
0
1140 LET D=5: LET AL=0: LET A$="
LEVEL(1)..": GO TO 1110
1150 LET D=7: LET AL=0: LET A$="
LEVEL(2)...": GO TO 1110
1160 LET D=9: LET AL=0: LET A$="
LEVEL(3)....": GO TO 1110
1170 PRINT AT 5,11;Q$(1);" ";SCH
1
1172 PRINT AT 7,12;Q$(2);" ";SCH
2
1173>PRINT AT 9,13;Q$(3);" ";SCH
3
1174 PLOT 0,75: DRAW 255,0
1175 LET D=13: LET AL=3: LET A$=
"CONTROLES:-"
1176 FOR A=1 TO LEN A$
1177 PRINT AT D,AL+A;A$(A TO A)
1178 BEEP .01,30
1179 NEXT A
1180 IF LEN A$=9 THEN GO TO 1183
1181 IF LEN A$=18 THEN GO TO 118
8
1182 LET D=15: LET AL=7: LET A$=
"Z....FIRE": GO TO 1176
1183 LET D=17: LET AL=7: LET A$=
"K....UP(ONCE ONLY)": GO TO 1176
1188 PRINT FLASH 1; INK 6;AT 20,
9;"PRESS ANY KEY"
1189 PAUSE 0: RETURN
1200 FOR Z=1 TO 3: DIM Q$(Z,13):
 NEXT Z
1210 LET Q$(1)="_____________"
1220 LET Q$(2)="_____________"
1230 LET Q$(3)="_____________"
1240 LET SCH1=0: LET SCH2=0: LET
 SCH3=0
1250 RETURN
1499 STOP
1500 RESTORE 1500: FOR Z=0 TO 7:
 READ A: POKE USR "A"+Z,A: NEXT
Z: DATA 0,126,126,126,126,126,12
6,0
1510 RESTORE 1510: FOR Z=0 TO 7:
 READ A: POKE USR "B"+Z,A: NEXT
Z: DATA 128+64+32+1+2+4,128+64+7
,255,255-128,63,3,3,0
1520 RESTORE 1520: FOR Z=0 TO 7:
 READ A: POKE USR "C"+Z,A: NEXT
Z: DATA 0,128,152,254,255,254,12
8,0
1530 RESTORE 1530: FOR Z=0 TO 7:
 READ A: POKE USR "D"+Z,A: NEXT
Z: DATA 195,126,126,90,126,126,6
0,24
1545 RESTORE 1550
1550 FOR z=0 TO 7: READ a: POKE
USR "e"+z,a: NEXT z: DATA 1,3,7,
15,31,63,127,255
1560 FOR z=0 TO 7: READ a: POKE
USR "f"+z,a: NEXT z: DATA 128,19
```

```
2,224,240,248,252,254,255
1570 RESTORE 1580
1580 FOR z=0 TO 7: LET D=INT (RN
D*255+1): READ a: POKE USR "G"+z
,a: NEXT z: DATA D,D,D,D,D,D,D,D
2040 RETURN
3500>: PAPER 0: INK 6: BORDER 0:
 CLS
3510 PRINT FLASH 1;AT 19,10;"LEV
EL (1/3)": FLASH 0
3515 INK 2: FOR A=0 TO 31: BEEP
.005,a: PRINT AT 0,A;"█";AT 21,A
;"█": NEXT A: FOR A=21 TO 1 STEP
 -1: BEEP .005,a: PRINT AT A,0;"
█";AT A,31;"█": NEXT A
3520 INK 6: PRINT AT 4,2;"3.....
.(EASY)";AT 6,2;"2......(QUITE H
ARD)";AT 8,2;"1......(VERY HARD)
";AT 15,2;"{ M.WILLIAMS SOFTWARE
 LTD.}"
3525 FOR A=7 TO 12: PRINT PAPER
2; INK 0; PAPER 5;AT A,27;"██":
NEXT A: PRINT INK 1;AT 6,27;"▲";A
T 11,25;"██"; PAPER 0; INK 1;AT
10,25;"▲"
3530 IF INKEY$>"3" OR INKEY$<"1"
 THEN GO TO 3530
3540 PAUSE 0: IF INKEY$="1" THEN
 LET L=-3: LET LE=1
3550 IF INKEY$="2" THEN LET L=2:
 LET LE=2
3560 IF INKEY$="3" THEN LET L=4:
 LET LE=3
3570 RETURN
4010 PRINT FLASH 1;AT 10,3;"YOU
NUT YOU COST US A PLANE"
4020 FOR Z=0 TO 50: BEEP .01,INT
 (RND*30)-20: NEXT Z
4041 IF LE=1 AND SC>=SCH1 THEN L
ET SCH1=SC: PRINT AT 15,1;"HIGH
SCORE INPUT NAME.MAX 13": INPUT
Q$(1)
4042 IF LE=2 AND SC>=SCH2 THEN L
ET SCH2=SC: PRINT AT 15,1;"HIGH
SCORE INPUT NAME.MAX 13": INPUT
Q$(2)
4043 IF LE=3 AND SC>=SCH3 THEN L
ET SCH3=SC: PRINT AT 15,1;"HIGH
SCORE INPUT NAME.MAX 13": INPUT
Q$(3)
4045 PRINT FLASH 1;AT 20,8;"ANOT
HER GO (Y/N) ?"
4050 PAUSE 0
4060 IF INKEY$="Y" OR INKEY$="y"
 THEN GO TO 15
4499 STOP
4500 BORDER 0: PAPER 1: INK 7: C
LS
4510 PRINT FLASH 1;AT 10,7;"WELL
 DONE YOU HAVE";AT 11,4;"COMPLEA
TED YOUR MISSION"
4520 FOR A=0 TO 60: BEEP .01,RND
*30: NEXT A
4522 IF LE=1 AND SC>=SCH1 THEN L
ET SCH1=SC: PRINT AT 15,1;"HIGH
SCORE INPUT NAME.MAX 13": INPUT
Q$(1)
4524 IF LE=2 AND SC>=SCH2 THEN L
ET SCH2=SC: PRINT AT 15,1;"HIGH
SCORE INPUT NAME.MAX 13": INPUT
Q$(2)
4526 IF LE=3 AND SC>=SCH3 THEN L
ET SCH3=SC: PRINT AT 15,1;"HIGH
SCORE INPUT NAME.MAX 13": INPUT
Q$(3)
4530 PRINT PAPER 1; FLASH 1;AT 2
0,8;"ANOTHER GO (Y/N)"
4540 PAUSE 0
4550 IF INKEY$="Y" OR INKEY$="y"
 THEN GO TO 15
4560 STOP
```

THE FOURIER SERIES

```
   2 FAST
   5 LET P=PI/PI
  10 LET S=P
  20 IF P>PI/PI THEN LET S=VAL "
2"
  30 FOR N=PI-PI TO VAL "63"
  40 LET Z=PI-PI
  50 FOR M=PI/PI TO P STEP S
  60 LET Y=VAL "60/(M*PI)*SIN (N
*M*PI/18)"
  70 LET Z=Z+Y
  80 NEXT M
  90 PLOT N,VAL "22"+Z
 100 NEXT N
 105 PRINT "1 TO ";P
 110 PAUSE VAL "100"
 115 CLS
 120 LET P=P+VAL "2"
 130~GOTO VAL "20"
```

A WELL KNOWN result from the **Fourier Series** is that a square waveform can be constructed from the infinite sum of the odd harmonics of sine waves. The Fourier program illustrates this formation as each term is added and also prints-out the range of the summation.

The program, written by Clive Bannister of Wittersham, Kent will run on a 2K ZX-81.

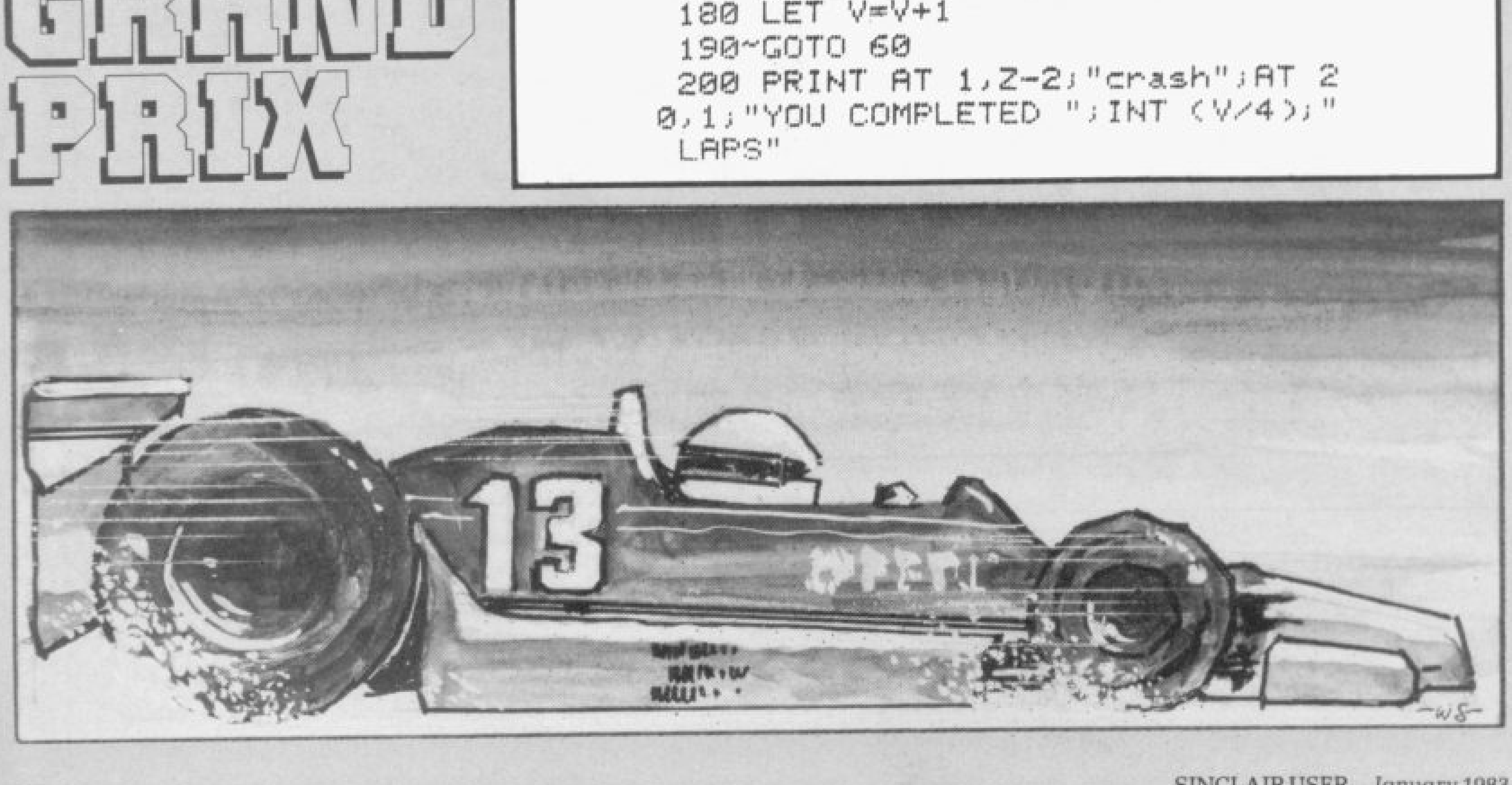
GRAND PRIX

GRAND PRIX is a dodgems game on traditional arcade lines. Your car, an inverse X, is displayed at the top of the screen and a roadway is scrolled up towards you. Steer the car with keys 1 and 0 and do your best to avoid crashing for as many laps as possible.

Two interesting features are a difficulty level and a progressively more crowded road. If the difficulty level 5 is selected, you will be able to see several lines ahead — very useful for planning your manoeuvres. Lower numbers reveal less of the road. In addition, as you speed down the track, the number of other cars increases.

Lower case letters in the listing signify inverse video (1K ZX81).

```
Q  10 PRINT "LEVEL 1-5?"
   20 INPUT N
   30 LET N=N*2
   40 LET V=0
   50 LET Z=15
   60 PRINT AT 0,Z;
   70 IF PEEK (PEEK 16398+256*PEE
K 16399)=187 THEN GOTO 200
   80 PRINT "x"
   90 LET A$="(eight inverse SPAC
Es)"
  100 FOR G=1 TO INT (V/100)+1
  110 LET P=INT (RND*8)+1
  120 LET A$(P)="v"
  130 NEXT G
  140 PRINT AT N,10;A$
  150 LET Z=Z+(INKEY$="0")-(INKEY
$="1")
  160 IF Z>17 OR Z<10 THEN GOTO 2
00
  170 SCROLL
  180 LET V=V+1
  190~GOTO 60
  200 PRINT AT 1,Z-2;"crash";AT 2
0,1;"YOU COMPLETED ";INT (V/4);"
 LAPS"
```





DAM BUSTER

IN DAM BUSTER for the 16K Spectrum you must save a dam from the aliens who are intent on breaking it down and flooding a village below. The dam is on the left of the screen and when the game starts the aliens start to move towards it from the right. You must stop the aliens by firing your rockets from a rocket launcher at the base of the dam. You fire the rocket by pressing the 'O' key.

You get one rocket per creature and if you miss the creature knocks a brick out of the dam. You must hit 10 of the aliens before your village is saved.

The game was sent by Tahir Abbas of Edinburgh. Graphics notes:

Line 80, six graphic Cs, and three graphic Bs.
Line 135, graphic E.
Line 610, graphic F.
Line 620, graphic A.
Line 2000, graphic D.

```
   1 REM [illegible]
   5 REM [illegible] written by TAHIR ABBAS
  10 REM [illegible]
  20 FOR f=0 TO 7: READ z: POKE
USR "a"+f,z: NEXT f
  30 FOR f=0 TO 7: READ z: POKE
USR "b"+f,z: NEXT f
  40 FOR f=0 TO 7: READ z: POKE
USR "c"+f,z: NEXT f
  45 FOR f=0 TO 7: READ z: POKE
USR "d"+f,z: NEXT f
  46 FOR f=0 TO 7: READ z: POKE
USR "e"+f,z: NEXT f
  47 FOR f=0 TO 7: READ z: POKE
USR "f"+f,z: NEXT f
  50 REM [illegible]
  60 BORDER 4: PAPER 5: CLS
  70 FOR f=20 TO 5 STEP -1
  80 PRINT INK 1;AT f,0;"[graphics]"
 INK 6;"[graphics]"
  90 NEXT f
 100 PRINT INK 6;AT 4,6;"[graphics]"
 110 PRINT AT 21,0;"[graphics]"
 120 PRINT AT 20,10;"[graphics]"
 130 PRINT AT 19,10;"[graphics]"
 135 PRINT INK 3;AT 19,11;"[graphic E]"
 140 REM [illegible]
 145 PAUSE 60
 150 LET sc=0
 155 LET x=30
 160 LET h=INT (RND*21): IF h>16
OR h<7 THEN GO TO 160
 170 GO SUB 500
 200 GO TO 170
 500 PRINT AT h,x;"[graphic] ": BEEP .01
,20:
 520 GO SUB 700
 540 IF INKEY$="0" THEN GO TO 60
0
 550 RETURN
 556 REM [illegible]
 600 FOR f=18 TO 5 STEP -1
 605 IF SCREEN$ (f,11)<>" " THEN
 GO TO 2000
 610 PRINT INK 0;AT f,11;"[graphic F]";: P
AUSE 1: PRINT AT f,11;" ":
 615 BEEP .005,f
 620 PRINT AT h,x;"[graphic A] "
 625 GO SUB 700
 6[illegible] NEXT f
 6[illegible] GO TO 540
 700 IF SCREEN$ (h,x-1)<>" " THE
N PRINT AT h,x-1;" ": BEEP .1,5
: GO TO 155
 710 LET x=x-1
 715 IF x=7 THEN GO TO 1000
 720 RETURN
 900 REM [illegible]
1000 PRINT AT h,x-1;"  ": BEEP
1,10: PRINT INK 1;AT h,x-1;"[graphics]"
1010 FOR f=h TO 20
1020 PRINT INK 1;AT f,6;"[graphic]": BEE
P .1,10
1030 NEXT f
1050 FOR f=20 TO h STEP -1
1060>PRINT OVER 1; INK 1;AT f,9;
"[graphics]": PAUSE
 3: BEEP .1,10: NEXT f
1070 PRINT AT 0,10;"Your city is
 flooded.";AT 2,10;"Your score="
;sc;AT 4,10;"Press any key for";
AT 5,10;"a new game."
1080 IF INKEY$="" THEN GO TO 108
0
1090 RUN
2000 FOR w=1 TO 15: PRINT INK 0;
AT f,11;"[graphic D]";: PAUSE 2: PRINT AT
f,11;" ": PAUSE 1: BEEP .02,w*2:
 NEXT w
2010 FLASH 0: PRINT AT f,11;" "
2020 LET sc=sc+1
2025 PRINT AT 15,2;sc
2026 IF sc<10 THEN GO TO 155
2029 PRINT AT 0,10;"You have sav
ed your";AT 1,10;"city";AT 3,10;
"Your score=";sc;AT 5,10;"Press
any key for";AT 6,10;"a new game
...."
2030 IF INKEY$="" THEN GO TO 203
0
2040 RUN
9000 REM [illegible]
9005 DATA BIN 00111100,BIN 01101
110,BIN 11111111,BIN 00001111,BI
N 00001111,BIN 11111111,BIN 0111
1110,BIN 00111100
9010 DATA BIN 11111111,BIN 10000
001,BIN 10000001,BIN 10000001,BI
N 10000001,BIN 10000001,BIN 1000
0001,BIN 11111111
9020 DATA BIN 10101010,BIN 01010
101,BIN 0,BIN 10101010,BIN 01010
101,BIN 0,BIN 10101010,BIN 01010
101
9030>DATA BIN 10011001,BIN 01011
010,BIN 01011010,BIN 11111111,BI
N 11111111,BIN 01011010,BIN 0101
1010,BIN 10011001
9040 DATA BIN 00011000,BIN 00011
000,BIN 00011000,BIN 00111100,BI
N 00111100,BIN 01111110,BIN 0111
1110,BIN 11111111
9050 DATA BIN 00011000,BIN 00111
100,BIN 00111100,BIN 00111100,BI
N 00011000,BIN 00111100,BIN 0111
1110,BIN 01111110
```

-WS-

A

PONTOON

BLACKJACK, Twenty-One, Chemin de fer. Call it what you will, we have an excellent listing for it. The display features a green baize table, the four suits in appropriate colours, and a neat pattern on the back of the cards.

The program has an error-trapping function and tells you whether have bust or won. You start with a stake of £1,000 and the chance to break the bank. Thanks to K Hart of Wakefield for a definitive listing. (48K Spectrum).

```
10 BORDER 4: PAPER 7: INK 0
20 CLS
30 LET z=0
40 PAPER 7
50 PRINT AT 1,11;"PONTOON"
60 PRINT AT 2,11;"▀▀▀▀▀▀▀"
70 LET x=1
80 PRINT ''
90 PRINT " The card values ar
e:-"
100 PRINT ''"   ""A""   = 1 or 11
"
110 PRINT " The computer will a
lways use"
120 PRINT " the best value."
130 PRINT ''"   ""10""-""J""-""Q""-
""K"" are value 10"
140 PRINT ''
150 PRINT " All other cards = t
heir number."
160 PRINT ''
170 PRINT
180 IF PEEK (USR "a"+3) <>0 THEN
 GO SUB 2260
190 PRINT TAB 2; FLASH 1,"Press
 any key to continue!!"
200 LET a$=INKEY$: IF a$="" THE
N GO TO 210
210 POKE 23692,42
220 PRINT ''''''''''''''
230 PRINT " The object of the g
ame is to"'"hold two or more car
ds which"'"total 21 or as near 2
1 as"'"possible without going ov
er 21."'"At the same time scorin
g more"'"than the dealer."
240 PRINT " A natural (a ten ca
rd + an ace)"'"is the best hand.
250 PRINT " Followed by"'"five or more card
s who's total"'"value is 21 or l
ess."'" If you win with either o
f these"'"you are paid one and h
alf times"'"your bet."
260 PRINT
270 PRINT " In a tie the dealer
 wins!!!"
280 PRINT ''''
290 LET st=1000
300 DIM a$(53,5)
310 LET c=0
320 REM Graphics C D F G
330 LET s$="♣♦♥♠"
340 REM █ is Graphics H
350 LET d$="11A0220330440550660
770880991█10J10010K"
360 FOR s=1 TO 4
370 LET a=2
380 IF s=1 OR s=4 THEN LET a=0
390 FOR n=1 TO 13
400 LET c=c+1
410 LET a$(c)=d$(n*3-2 TO n*3)+
s$(s)+STR$ a
420 NEXT n: NEXT s
430 LET r$="█████"
440 LET p$="█████"
450 PRINT AT 20,2; FLASH 1;"Pre
ss any key to continue!!!"
460 PAPER 4
470 IF INKEY$="" THEN GO TO 48
0
480 CLS
490 RANDOMIZE
500 PRINT AT 3,6; INK 7;"You ar
e "; INK 0; FLASH 1;p$
510 PRINT AT 6,4; INK 7;"Comput
er is "; INK 0; FLASH 1;r$
520 GO SUB 800
530 CLS
540 GO TO 930
550 REM Graphics I and 6 spaces
560 LET e$="▌      "
570 REM Graphics B E B E B E B
580 IF z=1 THEN LET e$="███████"
590 PAPER 7
600 FOR i=0 TO 8: PRINT AT v+i,
h;e$: NEXT i
610 IF z=1 THEN GO TO 770
620 LET f=CODE a$(c,3): LET f$=
a$(c,4)
640 INK VAL a$(c,5)
650 PRINT AT v+1,h+1;f$;AT v+7,
h+5;f$
660 PRINT AT v+2,h+1;a$(c,3);AT
 v+6,h+5;a$(c,3)
670 IF f=55 OR f=56 OR f=57 OR
f=151 THEN PRINT AT v+1,h+2;f$;"
 ";f$;AT v+7,h+2;f$;" ";f$
680 IF f=52 OR f=53 OR f=54 THE
N PRINT AT v+2,h+2;f$;"  ";f$;AT
 v+6,h+2;f$;"  ";f$
690 IF f=151 OR f=50 OR f=51 TH
EN PRINT AT v+2,h+3;f$;AT v+6,h+
3;f$
700 IF f=56 OR f=57 OR f=58 OR
f=151 THEN PRINT AT v+3,h+2;f$;"
 ";f$;AT v+5,h+2;f$;" ";f$
710 IF f=54 THEN PRINT AT v+4,h
+2;f$;"  ";f$
720 IF f=65 OR f=51 OR f=53 OR
f=57 THEN PRINT AT v+4,h+3;f$
730 IF f=55 THEN PRINT AT v+3,h
+3;f$;AT v+5,h+2;f$;" ";f$
740 IF f=74 THEN PRINT AT v+3,h
+4;"█";AT v+4,h+2;"▄ █";AT v+5,h
+2;"▀▀▀"
750 IF f=81 THEN PRINT AT v+3,h
+2;"▄▄▄";AT v+4,h+2;"█▄█";AT v+5
,h+2;"▀▀▄";AT v+6,h+4;"▀"
760 IF f=75 THEN PRINT AT v+3,h
+2;"█ ▄";AT v+4,h+2;"█▀ ";AT v+5,
h+2;"▀ ▀"
770 PAPER 4: INK 0
780 RETURN
790 CLS
800 PRINT AT 10,10; PAPER 7; FL
ASH 1;"SHUFFLING"
810 FOR c=53 TO 2 STEP -1
820 BEEP .01,c
830 LET a=(52-(RND*8))+1
840 LET a$(c)=a$(a): LET a$(a)=
a$(c-1)
850 NEXT c
860 FOR c=2 TO 53
870 BEEP .02,c
880 LET a$(c-1)=a$(c)
890 NEXT c
900 LET c=1
910 PRINT AT 10,10;"         "
920 RETURN
930 IF c>40 THEN GO SUB 790
940 LET z=1: LET d=0: LET da=0:
 LET p=0: LET pa=0
950 PAPER 7
960 PRINT AT 0,1;r$;AT 12,1;p$
970 LET l$=a$(c)
980 LET v=1: LET h=1
990 GO SUB 570
1000 LET z=0
1010 LET d=d+VAL a$(c,1 TO 2)
1020 IF VAL a$(c,1 TO 2)=11 THEN
 LET da=da+1
1030 LET c=c+1
1040 LET v=13
1050 GO SUB 570
1060 LET p=p+VAL a$(c,1 TO 2)
1070 IF VAL a$(c,1 TO 2)=11 THEN
 LET pa=pa+1
1080 LET c=c+1
1090 PRINT AT 14,8;"Your stake i
s £";st
1100 PRINT AT 16,8;"Please enter
 your bet!!"
1110 INPUT b$: IF b$="" THEN GO
TO 1110
1120 PRINT AT 14,8;"
 ";AT 16,8;"
"
1130 FOR i=1 TO LEN b$
1140 IF CODE b$(i)=46 THEN GO TO
 1230
1150 IF CODE b$(i)<48 OR CODE b$
(i)>57 THEN GO TO 1200
1160 NEXT i
1170 LET bet=VAL b$
1180 IF bet<=st THEN GO TO 1250
1190 PRINT AT 14,8;"You cannot b
et more";AT 16,8;"money than you
 have!"
1200 BEEP .8,-10: BEEP .3,-30
```

A



```
1210 PRINT AT 14,8;"
      ";AT 16,8;"
      "
1220 GO TO 1090
1230 PRINT AT 14,8;"Whole pounds
 only";AT 16,12;"PLEASE!!!"
1240 GO TO 1200
1250 PRINT AT 11,11;"You have be
t £";bet
1260 LET v=1: LET h=3
1270 GO SUB  570
1280 LET d=d+VAL a$(c,1 TO 2)
1290 IF VAL a$(c,1 TO 2)=11 THEN
 LET da=da+1
1300 IF da=2 THEN LET d=12: LET
da=1
1310 LET c=c+1
1320 LET v=13
1330 GO SUB  570
1340 LET p=p+VAL a$(c,1 TO 2)
1350 IF VAL a$(c,1 TO 2)=11 THEN
 LET pa=pa+1
1360 IF pa=2 THEN LET p=12: LET
pa=1
1370 LET c=c+1
1380 LET pc=2: LET dc=2
1390 LET h=h+2
1400 IF p=21 AND pc=2 THEN GO TO
 1610
1410 PRINT AT 14,h+7; PAPER 7; F
LASH 1;"Another card";AT 15,h+9;
"(Y or N)"
1420 LET c$=INKEY$
1430 IF NOT (c$="Y" OR c$="y" OR
 c$="N" OR c$="n") THEN GO TO 14
20
1440 IF INKEY$<>"" THEN GO TO 14
10
1450 PRINT AT 14,h+7;"
  ";AT 15,h+9;"
1460 IF c$="N" OR c$="n" THEN GO
 TO 1610
1470 LET pc=pc+1
1480 GO SUB  570
1490 LET p=p+VAL a$(c,1 TO 2)
1500 IF VAL a$(c,1 TO 2)=11 THEN
 LET pa=pa+1
1510 LET c=c+1
1520 IF p<22 OR pa<=0 THEN GO TO
 1560
1530 LET pa=pa-1
1540 LET p=p-10
1550 GO TO 1520
1560 IF p>21 THEN GO TO 1580
1570 GO TO 1390
1580 PRINT AT 16,h+6; PAPER 7; F
LASH 1;"BUST"
1590 LET p=0
1600 GO TO 1640
1610 PRINT AT 14,h+7; PAPER 7;"S
tand on "; FLASH 1;p
1620 IF pc>=5 THEN PRINT AT 15,h
+7; PAPER 7; FLASH 1;"[illegible]
"
1630 IF p=21 AND pc=2 THEN PRINT
 AT 15,h+6; PAPER 7; FLASH 1;"[illegible]
[illegible]"
1640 PAPER 7: FOR i=1 TO 9: PRIN
T AT i,1;"    ": NEXT i
1650 PRINT AT 3,2; INK VAL l$(5)
;l$(3);AT 2,2;l$(4)
1660 IF p=0 THEN GO TO 1850
1670 IF p=21 AND pc=2 THEN GO TO
 1850
1680 LET v=1: LET h=3
1690 LET h=h+2
1700 IF d<22 OR da<=0 THEN GO TO
 1740
1710 LET da=da-1
1720 LET d=d-10
1730 GO TO 1700
1740 IF dc>=5 AND d>11 THEN GO T
O 1850
1750 IF d>=17 THEN GO TO 1850
1760 PAUSE 50
1770 PAUSE 1+50*(dc=2)
1780 PAPER 7
1790 GO SUB  570
```

```
1800 LET d=d+VAL a$(c,1 TO 2)
1810 IF VAL a$(c,1 TO 2)=11 THEN
 LET da=da+1
1820 LET c=c+1
1830 LET dc=dc+1
1840 GO TO 1690
1850 IF d>21 THEN LET d=0
1860 PAPER 7: INK 0
1870 LET h=dc*2
1880 PRINT AT 5,h+7;"Dealer has"
;
1890 PRINT AT 6,h+(11-(d=0));
1900 IF d=0 THEN PRINT ; FLASH 1
;"BUST"
1910 IF d>0 THEN PRINT ; FLASH 1
;d
1920 IF d=0 THEN LET dc=3
1930 IF p=0 THEN LET pc=3
1940 IF d=21 AND dc=2 THEN LET p
=0
1950 IF pc=2 AND p=21 THEN LET d
=0
1960 IF dc>=5 AND d>0 AND pc<5 T
HEN LET p=0
1970 IF pc>=5 AND p>0 AND dc<5 T
HEN LET d=0
1980 IF pc>=5 AND dc>=5 AND d>=p
 THEN LET p=0
1990 IF d>=p THEN PRINT AT 0,9;
FLASH 1;"WINS": BEEP 1,-10: BEEP
 .3,-20
2000 IF p>d THEN PRINT AT 12,9;
FLASH 1;"WINS": FOR f=0 TO 30: B
EEP .01,f: BEEP .01,f+10: NEXT f
2010 IF d>=p THEN LET st=st-bet
2020 IF d<p THEN LET st=st+bet
2030 IF pc>=5 AND p>0 THEN LET s
t=st+(bet/2)
2040 IF pc=2 AND p=21 THEN LET s
t=st+(bet/2)
2050 LET st=INT st
2060 PAUSE 100
2070 PAPER 4
2080 CLS
2090 IF st>0 THEN GO TO  930
2100 PAPER 7
2110 PRINT AT 8,4;"You have no m
oney left";AT 10,9;"so you lose"
2120 FOR i=1 TO 50: NEXT i
2130 PRINT AT 12,1;"Press any ke
y for another game";AT 14,6;"Pre
ss ""ENTER"" to stop"
2140 LET v=CODE INKEY$
2150 IF v=0 THEN GO TO 2140
2160 PAPER 4
2170 CLS
2180 IF v=13 THEN GO TO 2210
2190 LET st=1000: LET x=x+1
2200 GO TO  930
2210 BORDER 1: PAPER 1: INK 7
2220 CLS
2230 PRINT AT 8,1;"Goodbye, it's
 been a pleasure";AT 10,6;"takin
g your money"
2240 PRINT AT 12,8;"You lost £";
x*1000
2250 BEEP .1,(RND*10): GO TO 225
0
2260 RESTORE
2270 FOR f=USR "a" TO USR "i"+7
2280 READ a
2290 POKE f,a
2300 NEXT f
2310 DATA 0,0,0,0,0,0,0,0
2320 DATA 170,85,170,85,170,85,1
70,85
2330 DATA 0,56,56,16,214,254,214
,16
2340 DATA 0,16,56,124,254,124,56
,16
2350 DATA 170,170,85,85,170,170,
85,85
2360 DATA 0,108,254,254,124,124,
56,16
2370 DATA 0,16,56,124,254,254,21
4,16
2380 DATA 152,164,164,164,164,16
4,164,152
2390 DATA 128,128,128,128,128,12
8,128,128
2400 RETURN
```

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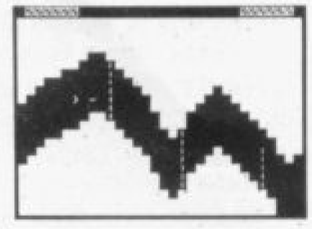
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Andrew Hewson.

Andrew Hewson looks at ways of programming at the limits of memory

Taking the modular approach to storing information

THIS MONTH I answer some questions concerned with the storage of data on ZX computers. The word data means information of any kind which the user might wish to store, for example, names and addresses of friends, details of a bank account, extracts from a train time-table or a diary of events.

It is important to realise that much more memory is required to store and manipulate data than for other computing tasks. That is partly because suitable programs tend to be lengthy, as many tasks are involved. It is a good idea to break such programs into so-called modules, where each module executes a particular task. A program, for example, might consist of modules to:

Declare the nature of the data to be stored and define the amount of memory to be allocated to each item.

Read the data from the keyboard.

Display the data in a logical fashion so that the user may check that it has been entered correctly.

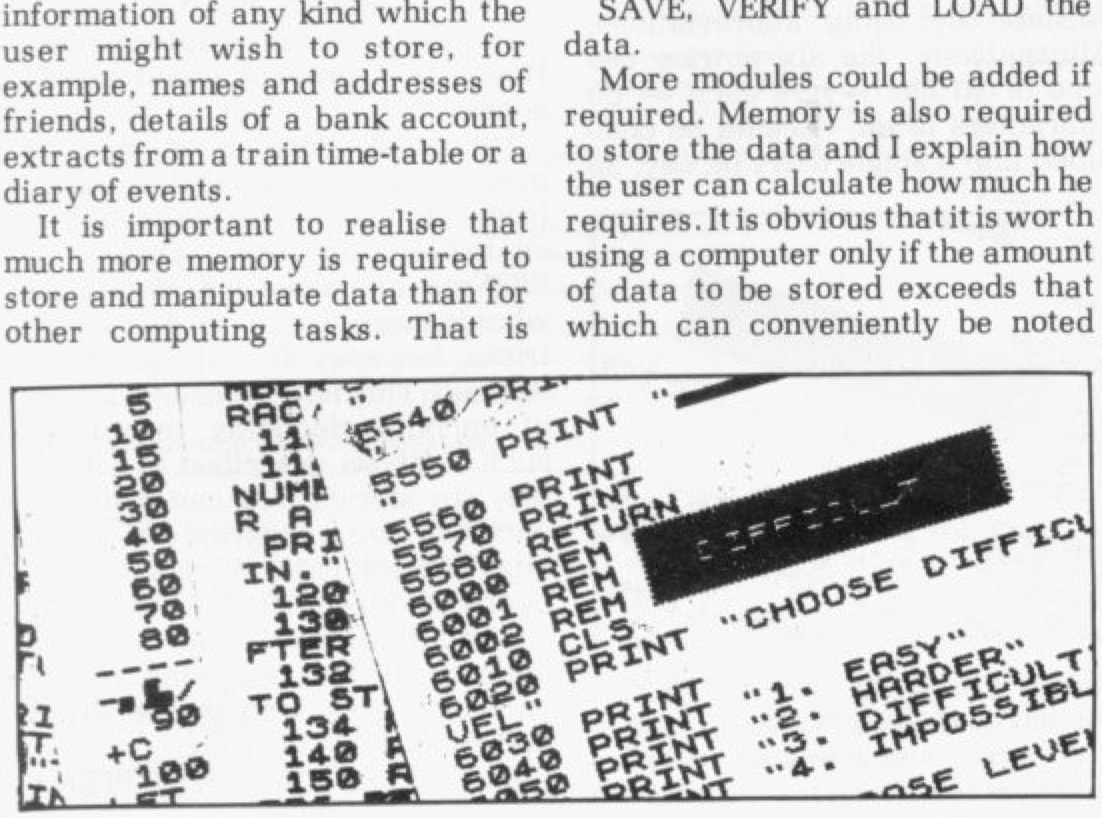
Correct erroneous values.

Print all or part of the data on request.

Sort the data alphabetically or numerically.

SAVE, VERIFY and LOAD the data.

More modules could be added if required. Memory is also required to store the data and I explain how the user can calculate how much he requires. It is obvious that it is worth using a computer only if the amount of data to be stored exceeds that which can conveniently be noted using more conventional systems, so it is safe to assume that the memory requirement will be substantial.



The first question is from Henry Evanson, of Bromborough. He has just obtained a 48K Spectrum and writes: **I now wish to to use 48K software packs but the first I purchased will not load. How can I check that I have received a 48K Spectrum and not a 16K machine by mistake?**

The answer is to check the high byte P-RAMT pointer at address 23733 by entering:

PRINT INT (PEEK 23733/4)-15; "K"

The machine sets the contents of 23733 to 255 — or 127 on the 16K Spectrum — when it is plugged-in and the line above performs a simple calculation and PRINTs 16K or 48K as appropriate.

At any particular time a user may run out of memory. Michael Fawcett has a problem with his ZX-81 in that regard. He writes: **When I get near to the end of entering a particular program the cursor disappears and whenever a key is pressed subsequently, a letter disappears. What is wrong?**

Many ZX-81 users will recognise in Fawcett's remarks that he is running out of memory. The only guaranteed solution is to buy an add-on RAM pack, although a certain amount of space can be saved by deleting REM statements and shortening PRINT statements. The Spectrum, incidentally, emits a low-pitched buzz when memory is short.

A check on the amount of memory left can be made at any time by entering the following REM at line 1:

1 REM RESERVE SOME SPACE

and POKEing the following numbers:

33, 0, 0, 57, 237, 91, 28, 64,
167, 237, 82, 68, 77, 201

into locations 16514, 16515 .... 16527 (on the ZX-81).

The equivalent locations on the Spectrum are 23760, 23761 ..... 23773 and the numbers to be POKEd are the same except that 101, 92 should be substituted for 28, 64. In each case a short machine code routine is loaded into the space

continued on page 66





continued from page 65

reserved in the REM statement and then the amount of memory left can be PRINTed by entering:

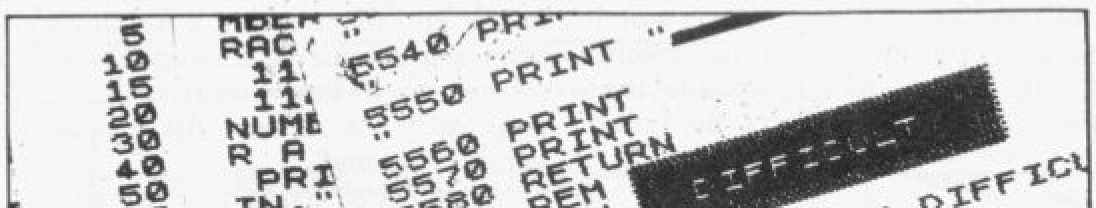
PRINT USR 16514 — 24; "BYTES"

or in the case of the Spectrum:

PRINT USR 23760 — 24; "BYTES"

Norman Disley of Cheshire has a collection of about 50 music cassettes which he wishes to catalogue on a Spectrum. He writes: **Each tune would require six or more entries — title name, soloist, and as each cassette contains about 30 titles the collection would use almost all of the 9999 lines of the Spectrum, leaving little room for later insertions. What can I do?**

Several people have written outlining the same idea of using the 9999 program lines available to store up to 9999 items of information. The technique has the merit of simplicity in use but there is no



possibility of writing a program to search, sort or PRINT the information.

The conventional technique is to store the information in a numeric or string array. The length of a numeric array is 4 + 2 * number of dimensions + 5 * total number of elements.

Thus, for example, the two-dimensional array N(2, 5) which contains 10 elements occupies 4 + 2 * 2 + 5 * 10 = 58 bytes.

A string array occupies 4 + 2 * number of dimensions + total number of elements and so Zs (2, 5) uses 4 + 2 * 2 + 10 = 18 bytes.

Disley wishes to store string data and so allowing 10 characters per entry, six entries per tune, 30 tunes per cassette and 50 cassettes, he would need to declare a string array:

Z$ (50, 30, 6, 10)

This would occupy

4 + 2 * 4 + 50*30*6*10 = 90012 bytes.

There are about 10,000 bytes available to the user in the 16K Spectrum and about 42,000 bytes in the 48K machine. Clearly Disley will not be able to hold all the data in the machine at the same time in that manner. The problem would still arise even if he were to use program lines, as each character in the line occupies one byte and there is an overhead of six bytes per line.

Space could be saved by using fewer than 10 characters per entry, perhaps by using abbreviations. Alternatively, the six entries per tune of 10 characters each — 60 characters in all — could be combined into a single entry of, say, 30 characters so that less space was wasted on trailing blanks.

A more sophisticated solution would be to hold all the information in one long string array and to use a second, numeric, array to point to the location in the string array at which each entry began. The slicing technique described in *ZX Spectrum Basic Programming* could then be used to select a given entry. The following program demonstrates the method:

```
10 DIM P(101): REM DECLARE
   POINTER ARRAY
20 LET PZ = 1
30 DIM Z$ (1000): REM DECLARE
   STRING ARRAY
40 INPUT "ENTER DATA"; A$
50 IF P(PZ) + LEN A$>1000 GOTO
   100
```



```
60 LET P(PZ + 1) = P(PZ + LEN A$)
70 LET Z$ (TO P(PZ + 1) = Z$
   (TO P(PZ)) + A$
80 LET PZ = PZ + 1
90 IF PZ<102 THEN GOTO 40
```

Finally, Robert Redrup asks: **I want to store sensitive information. How can I prevent unauthorised access?**

Ultimately there is no way to prevent the determined intruder from reading your cassettes into a suitable computer and then PEEKing at memory to determine what is there. There are two simple tricks, however, to make life more difficult. The first is to use some kind of encoding/decoding technique, such as those described in all the best spy stories. You can build the encoding into a program but omit a vital line and enter it from the keyboard before you RUN the program.

An alternative is to find the address of the beginning of the variables area held in the VARS system variable by using:

PRINT PEEK 23627 + 256*PEEK 23628

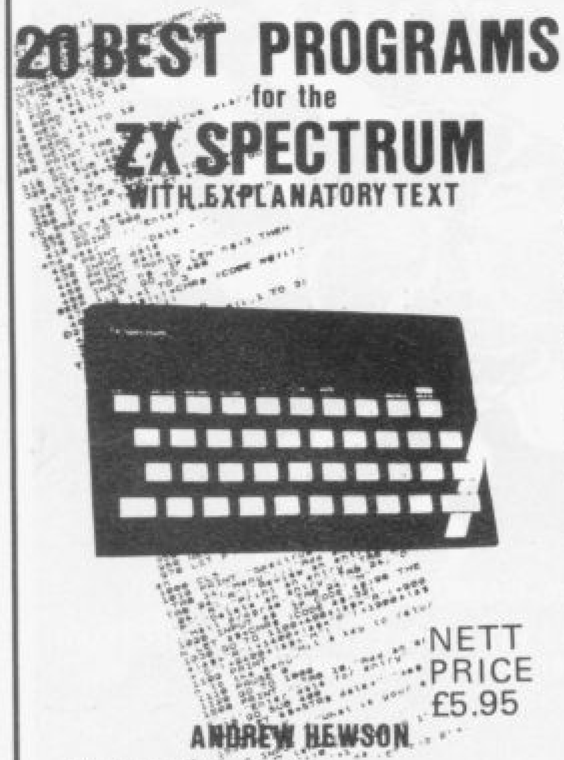
on the Spectrum, or

PRINT PEEK 16400 + 256*PEEK 16401

on the ZX-81. Then PEEK at the first few bytes of the area, jot down their content and then POKE in some random numbers instead. You will find that you can SAVE and LOAD as usual but your program will not work unless you POKE the correct numbers back into place. If you RUN the program it will work but all the variables will have been deleted.

● *Please address problems and queries to Andrew Hewson, Helpline, Graham Close, Blewbury, Oxfordshire.*

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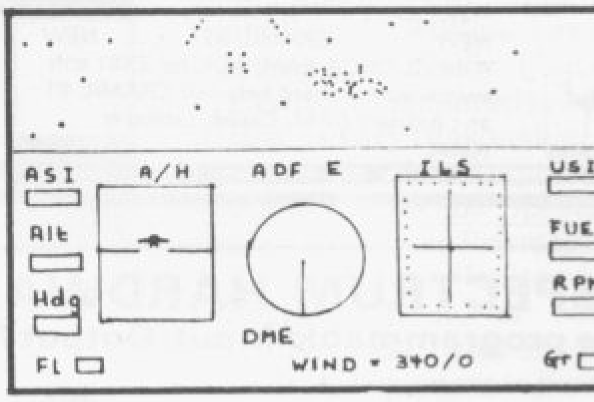
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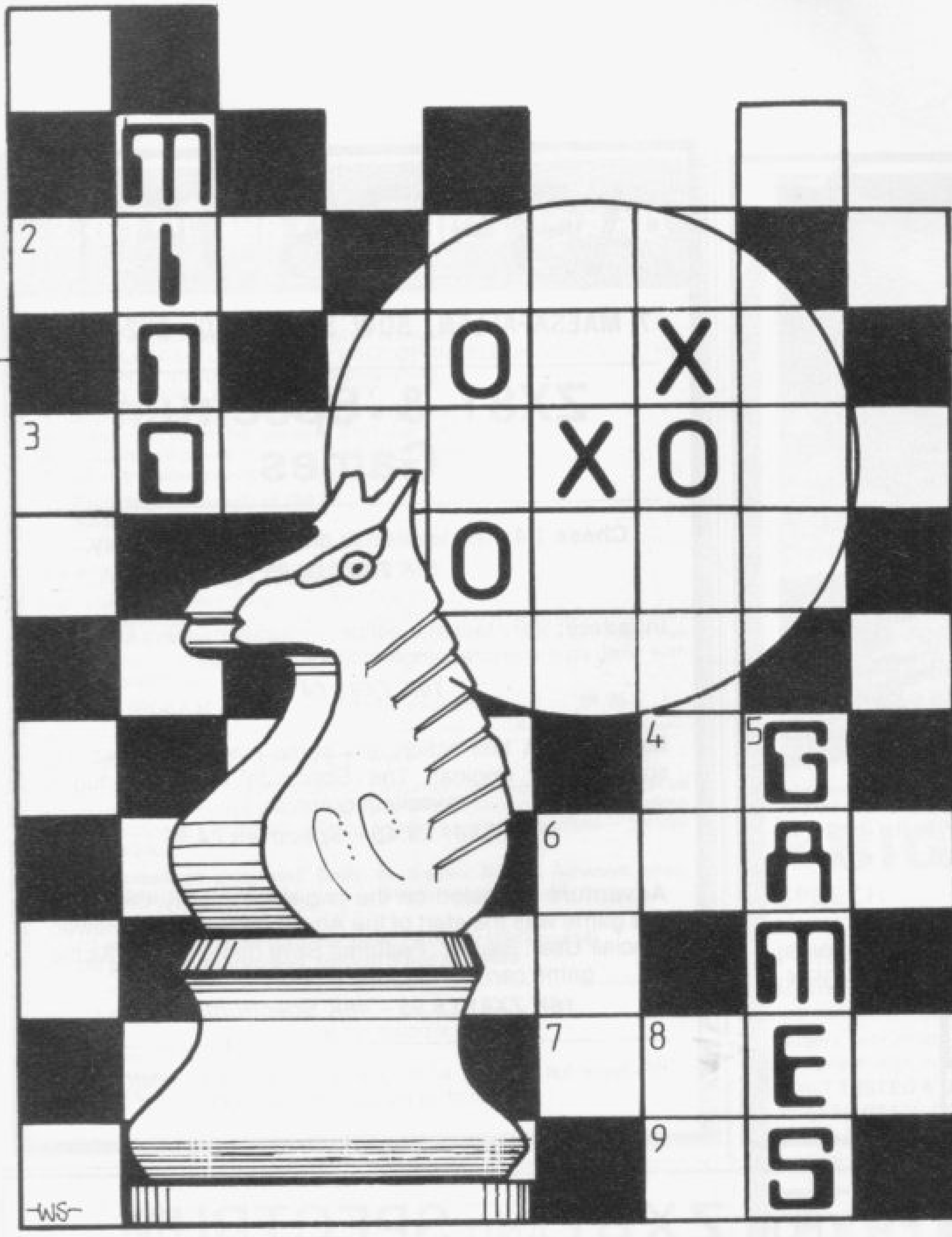
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Philip Joy looks at an adventure game

Grave difficulties

FOLLOWING my comments about adventure games in the last issue I have received a game called **Cheops Tomb**. It is available from Algor, Dovercourt, St. James Road, Northampton and the company claims it is probably the best adventure game on the market.

While allowing for the natural over-enthusiasm of the producer, I found that it was one of the best adventure games I have seen for the ZX-81. It is interesting and well-presented with excellent screen display and has an addictive quality about it.

The instructions are unusually well done and very clear but the game is complicated.

The idea is to try to find your way out of the tomb, which consists of a 16 by 5 maze of rooms. The maze includes treasures, weapons, gods, monsters, passageways and locked doors, for which keys must be found.

The player might be called on to fight a monster with varying amounts of strength. You are also able to cast spells of varying degree of effect, from sleep to death. The goal is to try to find the great key to let you out of the tomb.

The animals and gods will do their best to stop you in any way possible. Gods can appear from nowhere and kill you, without warning; that can ruin the game, as you have no chance to fight. One other point is that you have to enter the whole command, which can be as much as 20 words; therefore some abbreviations should be included. The game is well-priced at £7.

Now for a review of a flight simulator sent by David Cordiner of Birmingham. **Pilot** is a real-time aircraft simulator written entirely in Basic for the 16K ZX-81. The most obvious disadvantage of such a program is its speed. As a result of this the information displayed on the screen is updated only every few seconds. It gives the impression that the aircraft is not always responding to your inputs.

The program, however, contains some exceptional points, one of which is the aircraft attitude which can make the difference between a crash and a safe landing. The controls include up, down, left and right, with power, flaps and a good display of the instruments. The game has some humour, if you can call it that, when the flaps fall off at high speed.

The author says that the main reason for writing the program in Basic was so that the program could be studied and altered in places. It could therefore be used as a tool for learning about Basic. Pilot is priced at £3 which, compared to some other games, is very reasonable.

I have also received two versions of chess for the 48K Spectrum. The first game is from Prism Computing, 4 Little Lane, Poulton-Le-Fylde, Blackpool. It is, of course, in machine code, with six levels of play, from beginners to postal chess.

It can save a game on cassette and print-out a copy of the board for later reference. Prism says that the loudspeaker of the Spectrum is used in the game — that is, of course, if you can hear it.

The second game is from Artic Computing, 396 James Reckitt Avenue, Hull. The cover and cassette say that it is for the Spectrum but the loading instructions are for the ZX-81. Obviously that is an oversight, but it sounds very funny when a Spectrum game tells you to set up your ZX-81. The game has seven levels of play, with response times from two seconds to several minutes. You can analyse games by setting-up your own positions. The program can also recommend a move.

Now for the answer to last month's problem about adding all the prime numbers less the 5,000. There are 699 numbers, with the last one 4,999, and the sum being 1 548 135.

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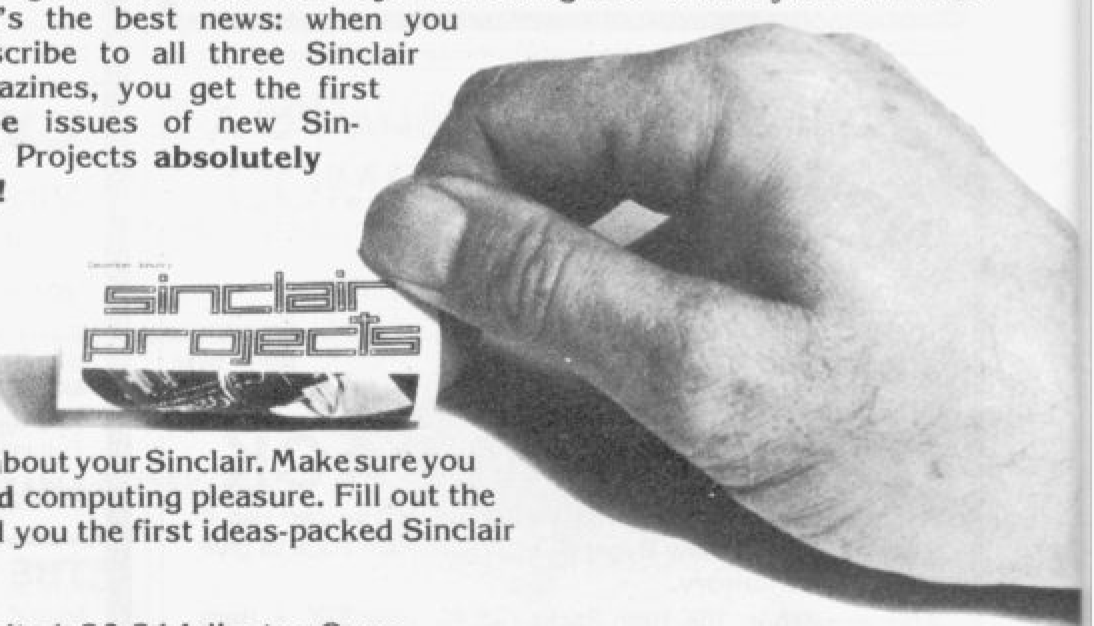
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